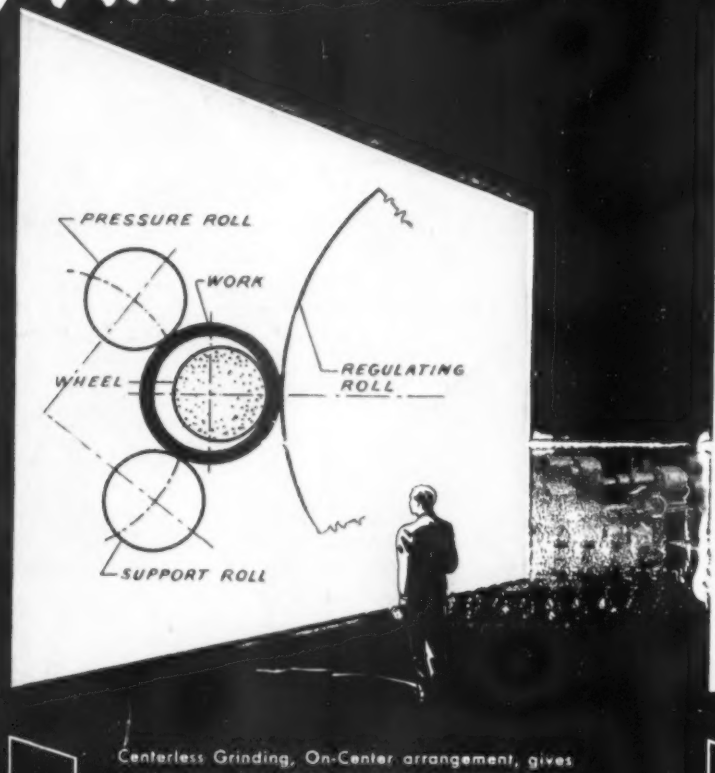
AUGUST 16, 1945

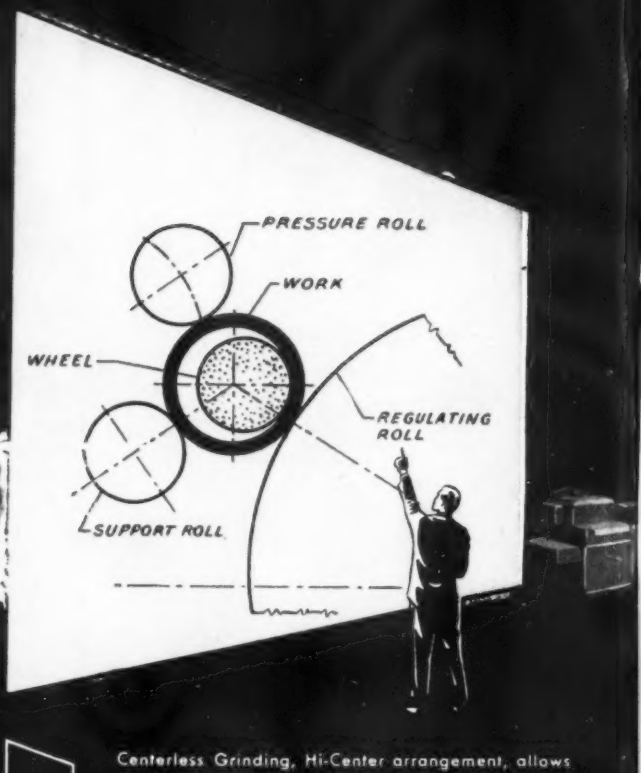
American Machinist

German Rocket Plant

PRINCIPLE WITH A FUTURE.



Centerless Grinding, On-Center arrangement, gives maximum support to the work which makes it possible to accurately grind parts having thin wall section without distortion.



Centerless Grinding, Hi-Center arrangement, allows the grinding to close limits parts of slighly varying outside diameters. Also multiple work can be ground simultaneously to the same tolerance.

Heald Internal Centerless Grinders offer more precision and greater production when bore must be concentric with O.D.

Carefully check the two drawings above. You can readily see how simple and efficient the Heald Centerless principle is. Between three rolls—a regulating roll, a support roll, a pressure roll—the work is held in direct contact from its O.D. No chuck is necessary—perfect concentricity between ground bore and O.D. assured—permits relocation of work without error for chucking or reversal—produces unusual accuracy on thin wall sections. On many jobs one operator can handle several machines—a completely automatic grinding cycle from feed hopper to delivery chute—if you wish and work permits.

Heald Internal Centerless Grinding Machines are available in a complete range of styles and sizes to suit specific jobs. The nature of the work dictates the sort of machine. It is this practice of fitting the machine to the job—and not the other way around—that has enabled Heald to hang up such an enviable reputation, wherever precision production is a must. It also provides a wealth of problem-solving experience that may hold just the answers you need in your plant. A Heald Engineer will be glad to go into a huddle with your people to help you get into your stride for the cost-conscious days ahead.

THE HEALD MACHINE COMPANY
WORCESTER 6, MASS.

More Precision · Less Cost **HEALD**

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

American Machinist

August 16, 1945

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American Machinist Chips

In This Issue . . . Carrol Edgar of Carboloy Company, Inc., gives a timely presentation on negative rake turning of steel, placing emphasis on its value in rough cutting and indicating some progress in facing and boring with negative rake angles. Tool recommendations are to the point and can be applied without difficulty by the average shop.

Bill Hargest, our sterling wartime correspondent in the London area, has gone underground. He digs with a purpose, however, and has collected data on assembly techniques on the once-dreaded V-2 bombs in what is said to be the largest underground factory in the world. This is at Nordhausen, Germany. You will find in this story interesting information on the space economy necessitated by industrial operation through a network of tunnels. Underground or not, many assembly methods parallel those of the great Detroit automobile plants.

Don't miss the third installment of Dr. G. V. Slottman's series on oxyacetylene cutting.

John E. Lynch and Carl W. Snyder of the San Diego Divison of Consolidated Vultee Aircraft Corporation describe in detail how cyanide nitriding of high-speed steel cutting tools substantially increases their life between grinds. All standard cutting tools and many special form tools are covered . . . as are gage parts.

In the News . . . Jones & Laughlin and Falk Corporation have recently brought out booklets quite a bit beyond the ordinary type of promotion.

They give lucid details, are profusely illustrated, and in general do a grand job for their companies and the Metal-Working Industry of which they are a part.

Still Good . . . Many of you will recall the series of special articles published by *American Machinist* in 1943 under the heading "Tools of Our Trade." In the past few years over 100,000 reprints of these employee-training aids have been distributed.

We still receive calls for these booklets —a pretty good indication of their value. The material they contain is basic and can be used today to help make skilled operators out of green hands. In fact, Harvard University just bought some to use in training Navy officers to know more about the tools they will have to deal with in handling surplus disposal.

We still have a limited supply of each of the five reprints shown below and we invite you to send for them while they last. They are 10c each, slightly less in quantities.

Okinawa Letter . . . A concrete example of what the boys overseas are thinking about in the way of postwar jobs is given in the following letter from Captain Bernard C. Borning of the 10th Field Artillery, written from a foxhole on Okinawa:

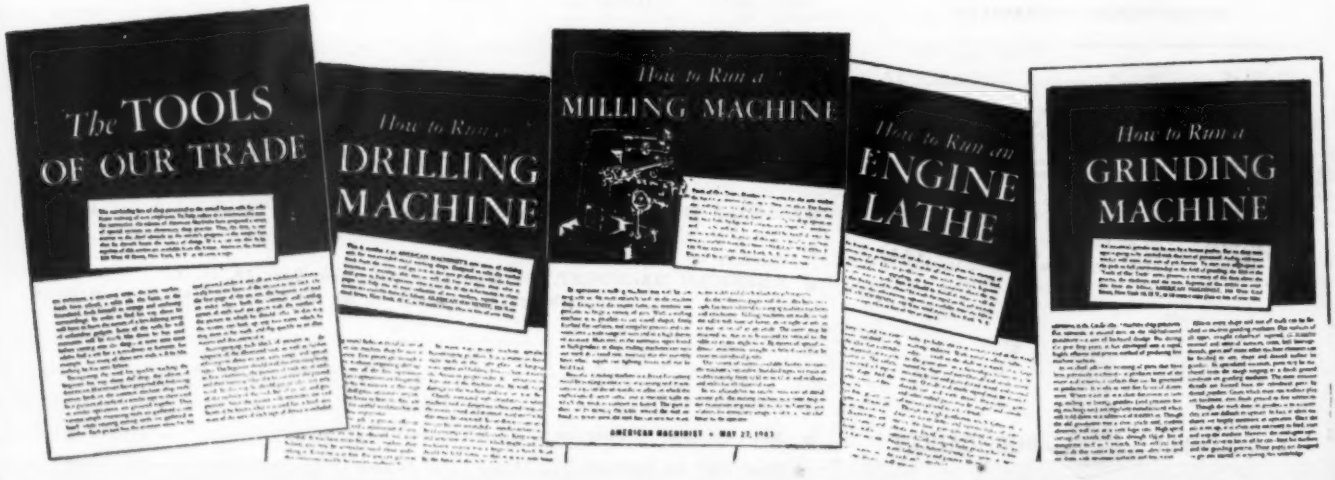
"This letter is the result of comparing postwar plans with a friend of mine camped across the mud, 1st Lt. J. B. Abbink, whom I understand is well known to you. He suggested you would be interested in my postwar activities.

"I am prepared to spend considerable time in Asia digging up dope and writing on industrial development, foreign trade, resources, business trends, and the like. I believe industrialists and business-men in America will be interested. This type of work is not new to me, since I was doing the same thing in South America before the war.

"Will be interested in your reply to this, and whether you think American Machinist *can use such material."*

We advised Captain Borning that our readers would quite possibly be interested in some of the material he would find and that we would go into the matter further when we knew more about his specific projects.

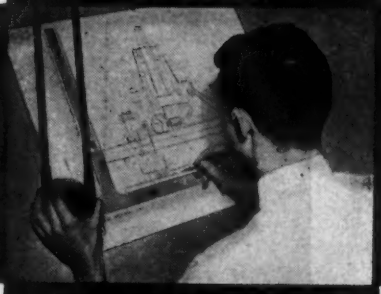
Incidentally, Lieutenant Abbink mentioned in the letter is the son of John Abbink, Vice President and Director of McGraw-Hill.


The TOOLS OF OUR TRADE
How to Run a DRILLING MACHINE
How to Run a MILLING MACHINE
How to Run an ENGINE LATHE
How to Run a GRINDING MACHINE

to help you

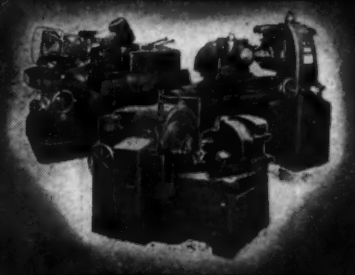
1 SOLVE BEVEL GEAR DESIGN PROBLEMS

BEVEL GEAR DESIGN ENGINEERING



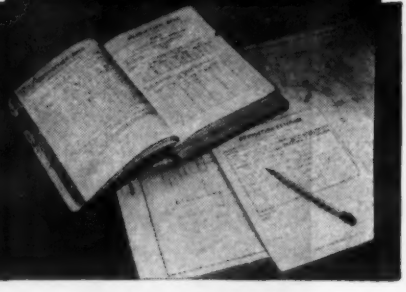
2 OBTAIN THE RIGHT EQUIPMENT FOR YOUR NEEDS

BEVEL GEAR EQUIPMENT ENGINEERING



3 ESTIMATE YOUR PRODUCTION TIME AND COSTS

BEVEL GEAR PRODUCTION ENGINEERING



the COMPLETE Gleason Engineering Service . . .

. . . when you have a problem involving bevel gear design or production, the solution can be secured from the Gleason Works—without obligation. Highly skilled engineers, backed by the company's *80 years' experience* in designing bevel gears and building bevel gear machinery, will study your bevel gear drive designs. Profitable improvements are often suggested. Correct gear cutting machines, tools and auxiliary equipment to meet your specific manufacturing requirements will be recommended. Further, we'll prepare for you estimates of production time, based upon actual shop practice. By utilizing this complete service you can save time and money.

WHAT WE NEED to help you

FOR PRODUCTION ENGINEERING

1. Blueprints of your bevel gear designs.
2. Material specifications and manufacturing tolerances.
3. Quantity of gears to be produced per month.
4. Number of working hours per month available for gear production.

FOR DESIGN ENGINEERING

1. Preliminary layouts or prints of proposed bevel gear drive designs.
2. Type of drive.
3. Horsepower and speed required.
4. Type of loading (constant, intermittent or shock).
5. Driving member and direction of rotation.

For informative literature on the design, manufacture and application of straight, spiral and Zerol bevel and hypoid gears, write on your firm's letterhead.

GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Eighty Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

Milling two parts at the same time on a **CINCINNATI** *No. 2-24 Automatic Rise and Fall Milling Machine. Notice that there are no pronounced cutter marks or scratches on the milled surface. .*

KEEP YOUR PAYROLL ALLOTMENT FOR WAR BONDS UP TO 15% OR MORE

CINCINNATI

THE CINCINNATI

MILLING MACHIN

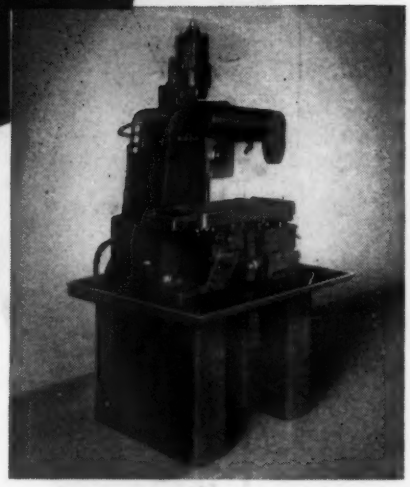
Rise and Fall Feature OF CINCINNATI AUTOMATIC MILLERS

ELIMINATES *Scratches and Cutter Marks*

CUTTER RAISES AUTOMATICALLY

. . . FOR RAPID RETURN OF TABLE

When you mill straight cuts on ordinary machines, the work will be scratched if the table is rapid returned with the cutter stopped, and if the cutter is running, the work will be cutter marked. Rise and Fall Spindle Carriers eliminate all this because after milling, the cutter moves up and out of the way as the table rapid returns to the starting position. ¶ This is just another advantage of the Rise and Fall feature of CINCINNATI 0-8 and 2-24 Automatic Millers. Then, too, the Rise and Fall feature enables the cutter to jump obstructions automatically, as shown in the illustration on the opposite page. ¶ Get all the facts about the usefulness and versatility of Rise and Fall equipped CINCINNATI Millers. For complete specifications on the 0-8's, write for Catalog M-964-1, and for the 2-24's, Catalog M-909-1. Sweet's Catalog File for Mechanical Industries gives a brief description of these milling machines.



CINCINNATI *No. 0-8 Plain Automatic Rise and Fall Milling Machine.*

CINCINNATI *No. 2-24 Automatic Rise and Fall Milling Machine.*

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

you wouldn't

Nor would you put carbide cutting tools on a lathe lacking the fundamental rigidity for their use. Carbide tools have increased cutting speeds from 200 to 500 per cent. They require as much as 300 per cent more horsepower.

Modern Jones & Lamson Turret Lathes are designed specifically to carry this extra load, and more. They have the rigidity, they can transmit the power, they are easy to operate.

THE KEEN COMPETITION TO COME will make us all more cost-conscious than ever. Our jobs, and our earnings, as well as profits, will depend upon maximum production from the most efficient machines.

Now is the time to check your equipment. Plan now to scrap obsolete machines and replace them with good War Surplus machines or new machines. Our engineers will be glad to assist you.

What HORSEPOWER Are You Using?

This cut, on 2-inch bar stock, requires 300 per cent more horsepower with a carbide tipped tool than with a high speed steel tool, and Carbide halves the cutting time.

Engineered to "Carry the Load" for Most Productive Operation With Carbide Cutting Tools

Turret Lathes

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

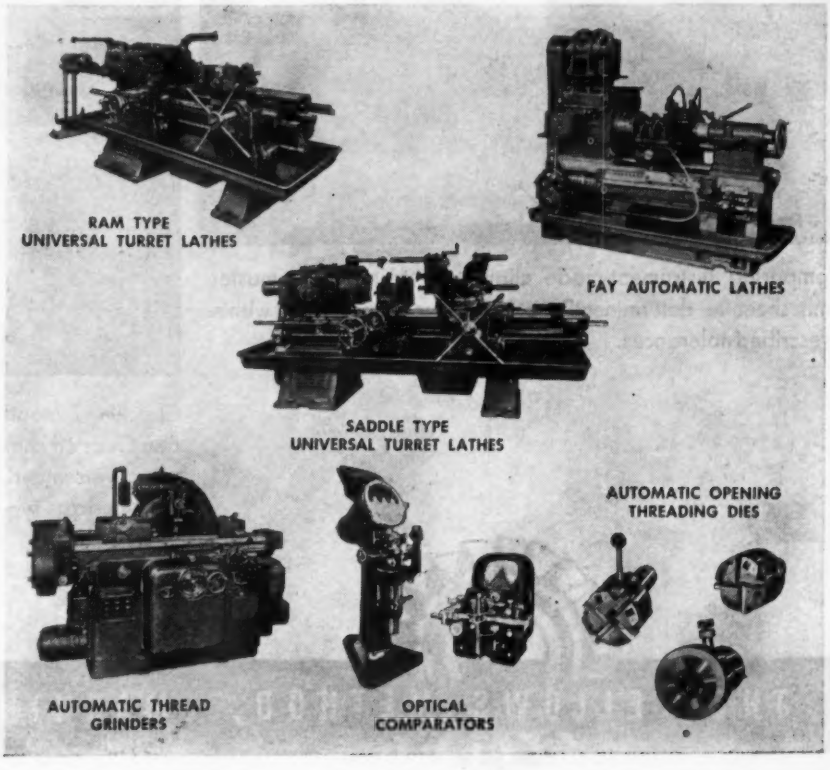
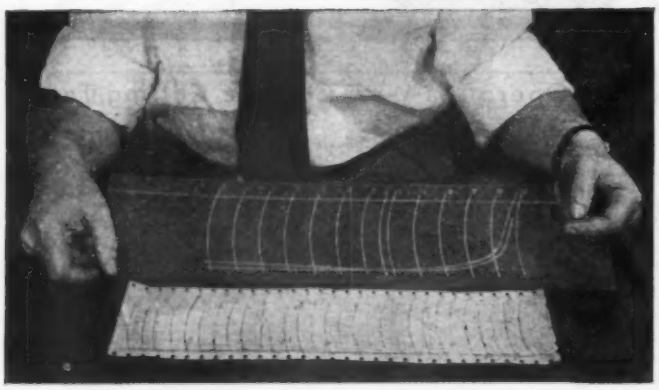
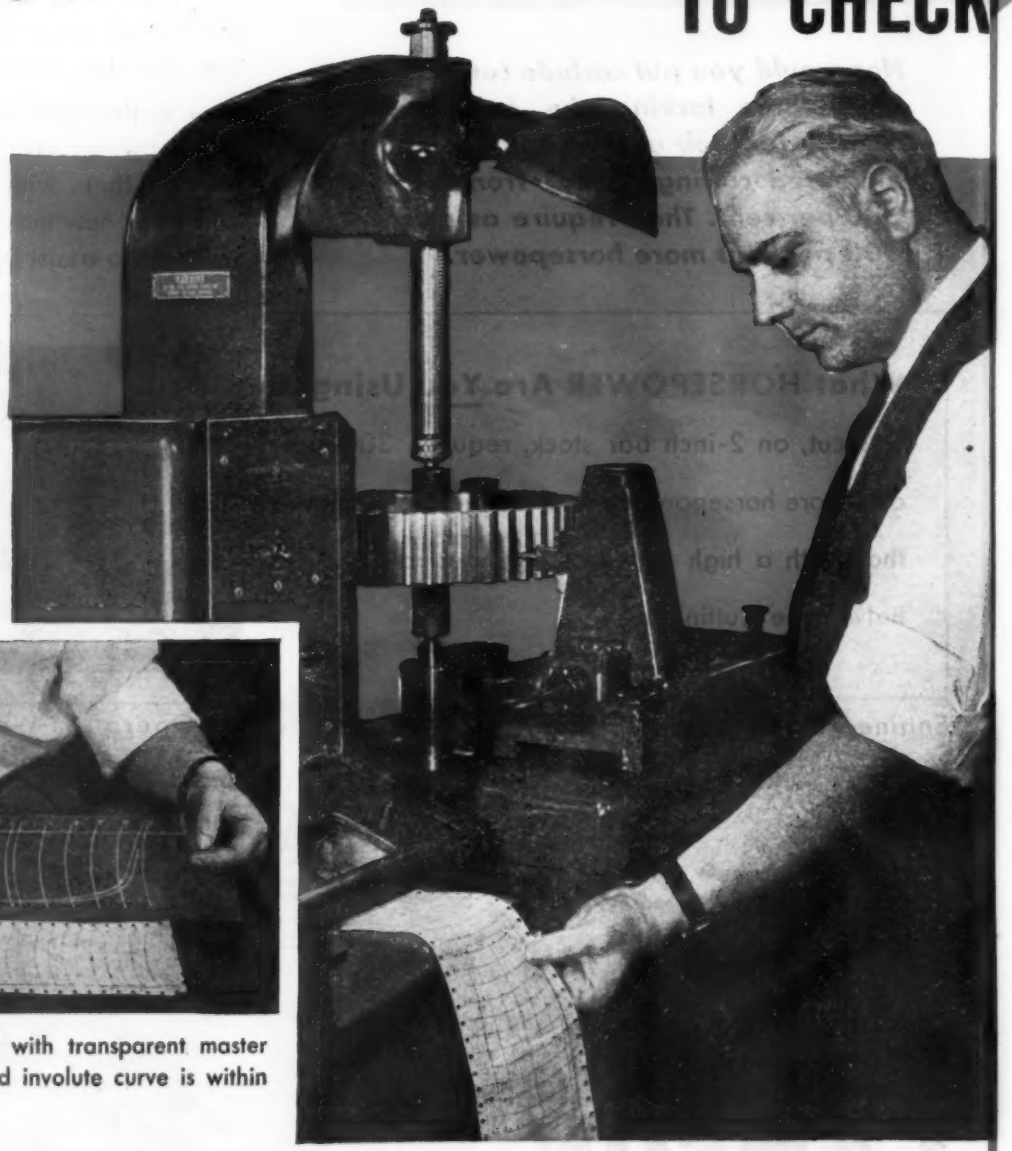


Chart Recording ... TO CHECK



Comparing instrument-made chart with transparent master limit sheet to determine if modified involute curve is within prescribed tolerances.



Checking a modified Involute Propeller Shaft Reduction Gear on chart-recording Fellows Involute Measuring Instrument. Photographs through the courtesy of American Type Founders.

THE FELLOWS METHOD... MACHINES AND TOOLS FOR

..THE ONLY DEPENDABLE WAY
CK A MODIFIED INVOLUTE GEAR

In the "in-line" engine that powers the deadly P-51 Mustang, the propeller shaft reduction gear, made by American Type Founders at Elizabeth, N.J. requires exceptionally precise involute inspection.

By an interesting adaptation of the Fellows Involute Measuring Instrument routine, exact control over precompensation for heat-treat distortion is established. The Instrument's charted record discloses the precise amount and location of involute modification for each gear tooth.

By superimposing a transparent plastic master modification sheet, the charted curve can be instantly checked against the predetermined standard.

Without a charting Instrument, and this comparison overlay, equivalent control would acquire so involved a series of readings and computations as to multiply the present inspection costs many times over.

Like most manufacturers of precision gears, you, too, will find that this Fellows Involute Measuring Instrument offers greatest ease of operation and absolute control over involute inspection in all stages of production. For details write: The Fellows Gear Shaper Company, Springfield, Vermont, or 616 Fisher Bldg., Detroit, or 640 West Town Office Bldg., Chicago.

GEAR TOLERANCES

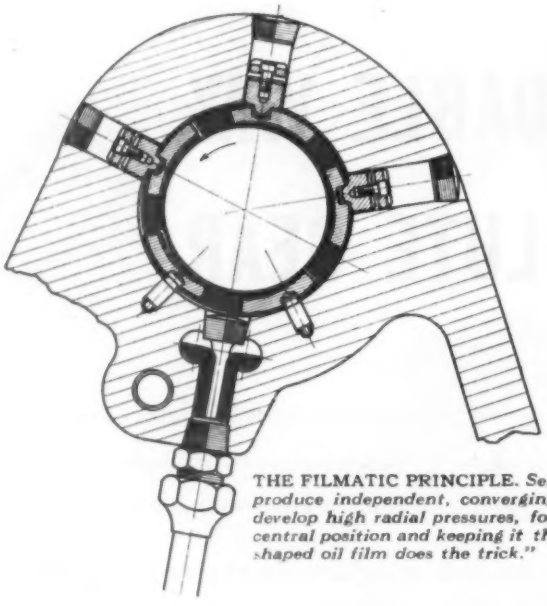
Parallelism of teeth to bore	*.0003"*
Max. allowable index error tooth to tooth	*.0002"*
Concentricity of teeth to bore	*.0002"*

INVOLUTE

Approximate amount of modification from pitch line out	*.005"*
Must be true to modified form within	*.0002"*

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR



THE FILMATIC PRINCIPLE. *Self-adjusting shoes produce independent, converging oil films which develop high radial pressures, forcing spindle into central position and keeping it there. "The wedge-shaped oil film does the trick."*

FILMATIC ON *give*

CINCINNATI

A recent survey reveals that 38% of all metal working equipment installed in American industry is more than ten years old, and 54% of all privately owned equipment is more than ten years old. This means that many antiquated grinding machines should be replaced with new, highly productive equipment. ¶ If your rehabilitation plans call for the purchase of new centertype or centerless grinders, be sure to select CINCINNATI Grinding Machines with their exlusive FILMATIC Bearings that offer you so many benefits. Keep this important fact in mind: *No down time has ever been charged against a FILMATIC equipped* CINCINNATI *Grinding Machine because of spindle bearing failure,* and these machines have been in operation for years on all types of grinding jobs. ¶ Get all the facts about FILMATIC Bearings. There's an interesting story about these bearings in booklet No. G-446. A copy will be sent on request. Specifications and complete information are also available on the extensive line of CINCINNATI Grinding Machines. When writing for catalogs be sure to mention name of machine in which you are interested. A brief description of all CINCINNATI Grinding Machines may be found in Sweet's Catalog File for Mechanical Industries.

KEEP YOUR PAYROLL ALLOTMENT FOR **WAR BONDS** UP TO **15%** OR MORE

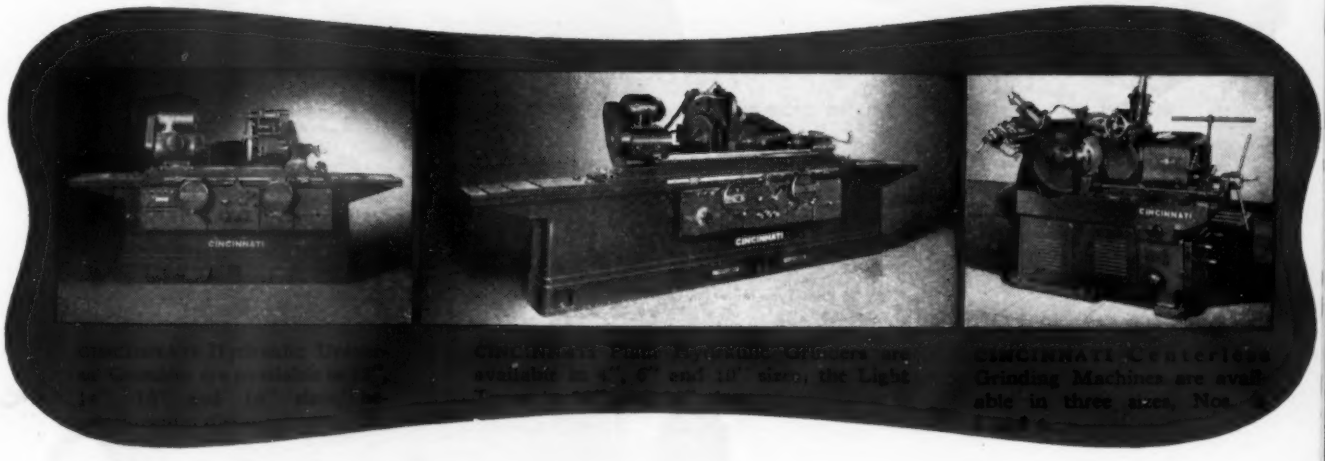
CINCINNATI

CENTER TYPE GRINDING MACHINES

BEARINGS

CINCINNATI GRINDING MACHINES *give you these advantages*

1. LONGER BEARING LIFE
2. NO SEIZURE • NO BREAKDOWN
3. NO PAMPERING OF BEARINGS
4. QUICK SPARK-OUT
5. STOPS PECKING OF THE DIAMOND



CINCINNATI Plain Type Cylindrical Grinders are available in 4", 6" and 10" sizes; the Light

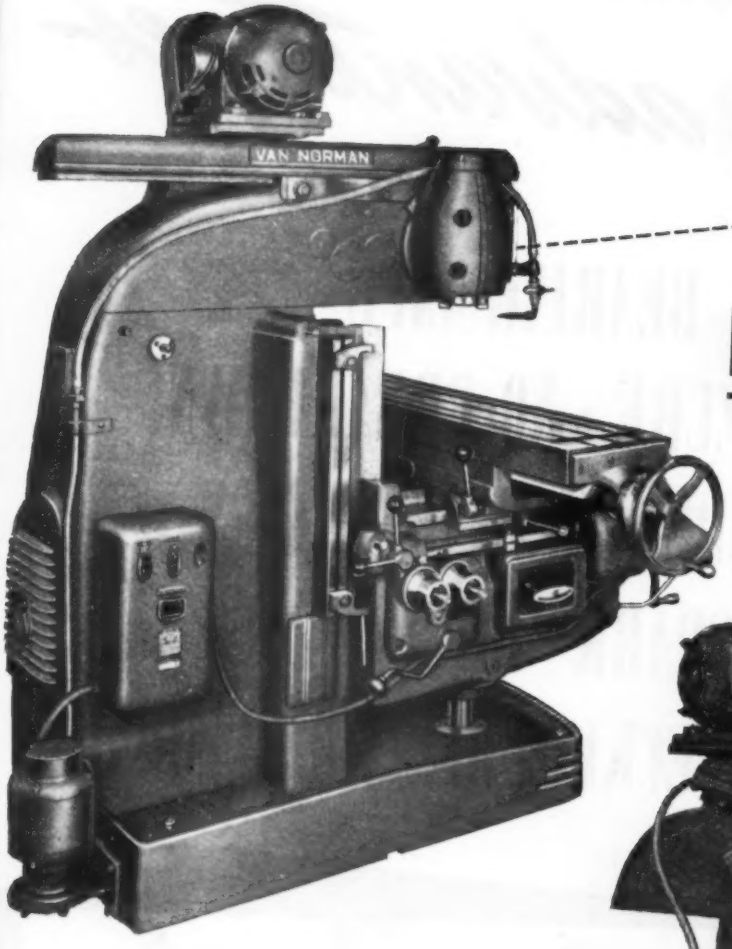
CINCINNATI Centerless Grinding Machines are available in three sizes, Nos.

GRINDERS INCORPORATED

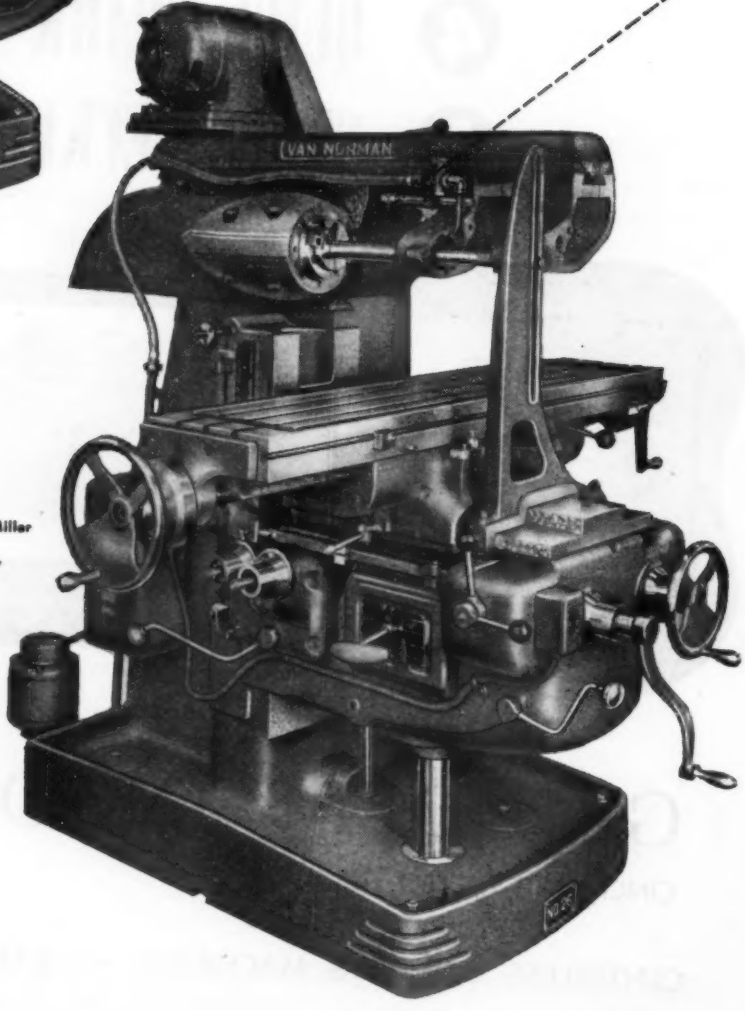
CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

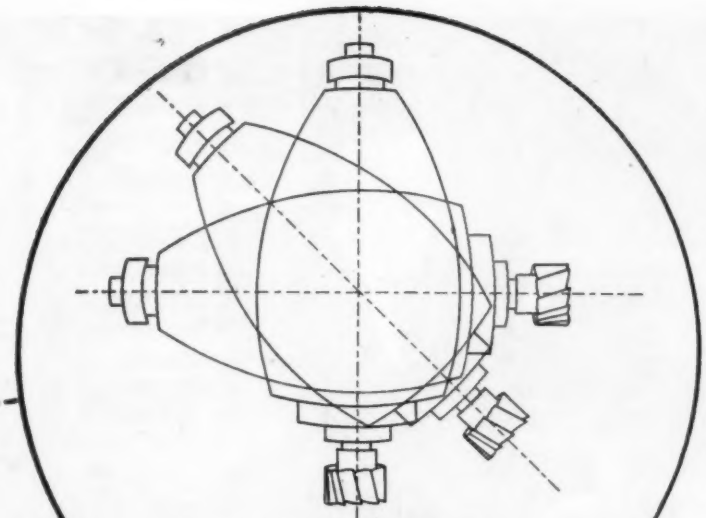
For High Production Output...and Low Idle Machine Time



No. 36 Ram-Type Miller
Table: 58" x 13"
Ram movement 19"



No. 26 Ram-Type Miller
Table: 50" x 12"
Ram movement 19"



HORIZONTAL . . . ANGULAR . . . VERTICAL MILLING

One Van Norman Ram Universal Miller gives You the work range of several types of millers.

USE VAN NORMAN RAM-TYPE MILLING MACHINE

One machine tool that you won't have to worry about at reconversion time is a Van Norman *Ram-Type* Milling Machine . . . for this miller is so versatile that it enables you to perform any and every milling job from horizontal to vertical . . . simply by positioning the adjustable cutterhead which is mounted on a movable ram. Why do you benefit . . . because with this one machine you have the work range of several single purpose millers. This enables you to keep the Van Norman miller working practically all the time . . . also many jobs can be carried through to completion without changes in the workpiece setup — saving time and reducing errors.

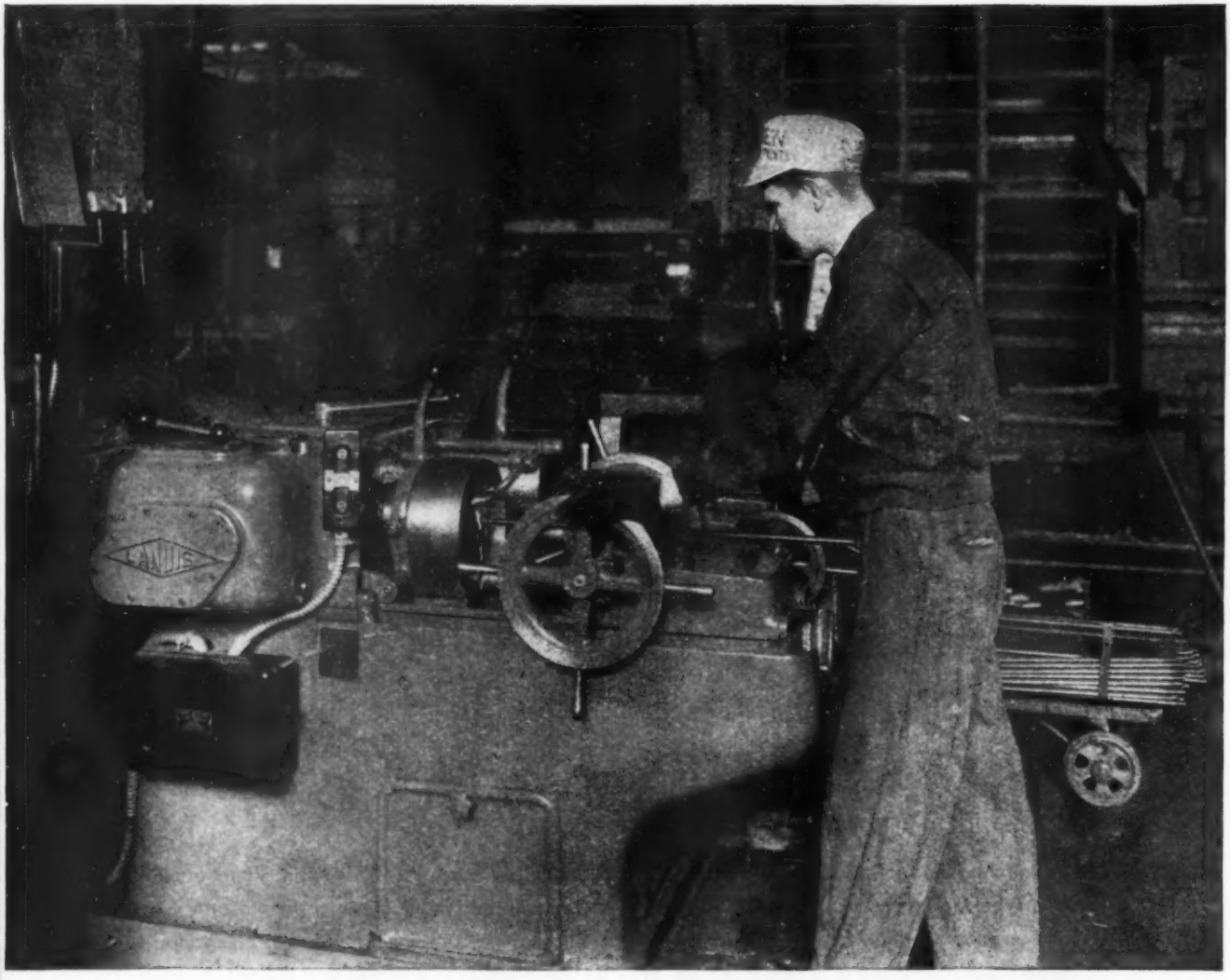
Another reason the *Ram-Type* miller increases production is the front and rear directional control of power feeds and manual feeds . . . resulting in ease of operation, less worker fatigue since he doesn't have to run back and forth to line up or watch the cut.

The massive column, heavy-duty movable ram which has dovetail ways, and large knee, saddle and table assemblies provide exceptional rigidity which assures accuracy of every type of cut. In addition, such features as large, easy-to-read dials, single lever feed selector, conveniently located and easily reached speed selector, rugged Ram-Type overarm and arbor support, hardened alloy steel precision gears — all assure accuracy, economy and maximum production. Van Norman *Ram-Type* Millers are available in many models with plain or swiveling tables. Write for information, today.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"



An All-Purpose Threading Machine . . . . . The LANDMACO

The Landmaco Threading Machine here illustrated is a general purpose machine. The thoroughly modern design, which permits quick set-up changes, makes it ideal for the short production run of tie-rods, a single rod for maintenance or a rush call for some special-threaded parts.

Its high operating speed assures unusual production figures in threading tough alloy steel jobs to close tolerances or in cutting the average commercial threads used in construction, reclamation and maintenance.

The Landmaco Threading Machine is accurate, fast, dependable and will handle all demands with a minimum of delay.

Write for Bulletin H-75

LANDIS MACHINE COMPANY

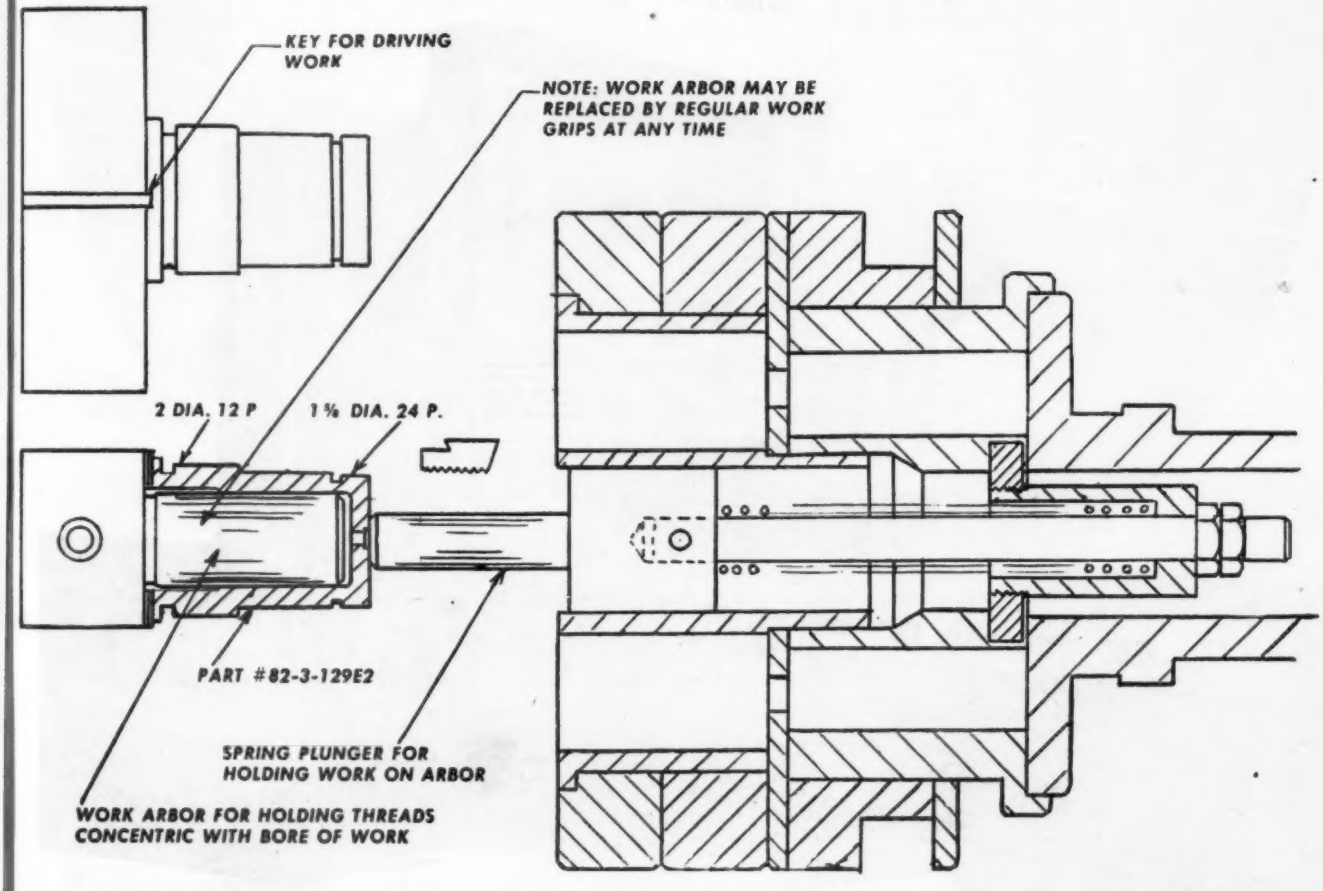
A Good Mechanic Knows and Cares For His Machine

LANDIS REG. U.S. TRADE—MARK PAT. OFF.

THREAD TIPS

In the Interest of Efficiency, Better Workmanship and Higher Production

WORK HOLDING FIXTURE FOR THREADING SHELL ADAPTERS ON 1½" LANDMACO MACHINE


KEY FOR DRIVING WORK
NOTE: WORK ARBOR MAY BE REPLACED BY REGULAR WORK GRIPS AT ANY TIME
2 DIA. 12 P
1⅛ DIA. 24 P.
PART #82-3-129E2
SPRING PLUNGER FOR HOLDING WORK ON ARBOR
WORK ARBOR FOR HOLDING THREADS CONCENTRIC WITH BORE OF WORK

Be Threadwise — Employ LANDIS Long Life Tangential Chasers

WAYNESBORO, PENNSYLVANIA, U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

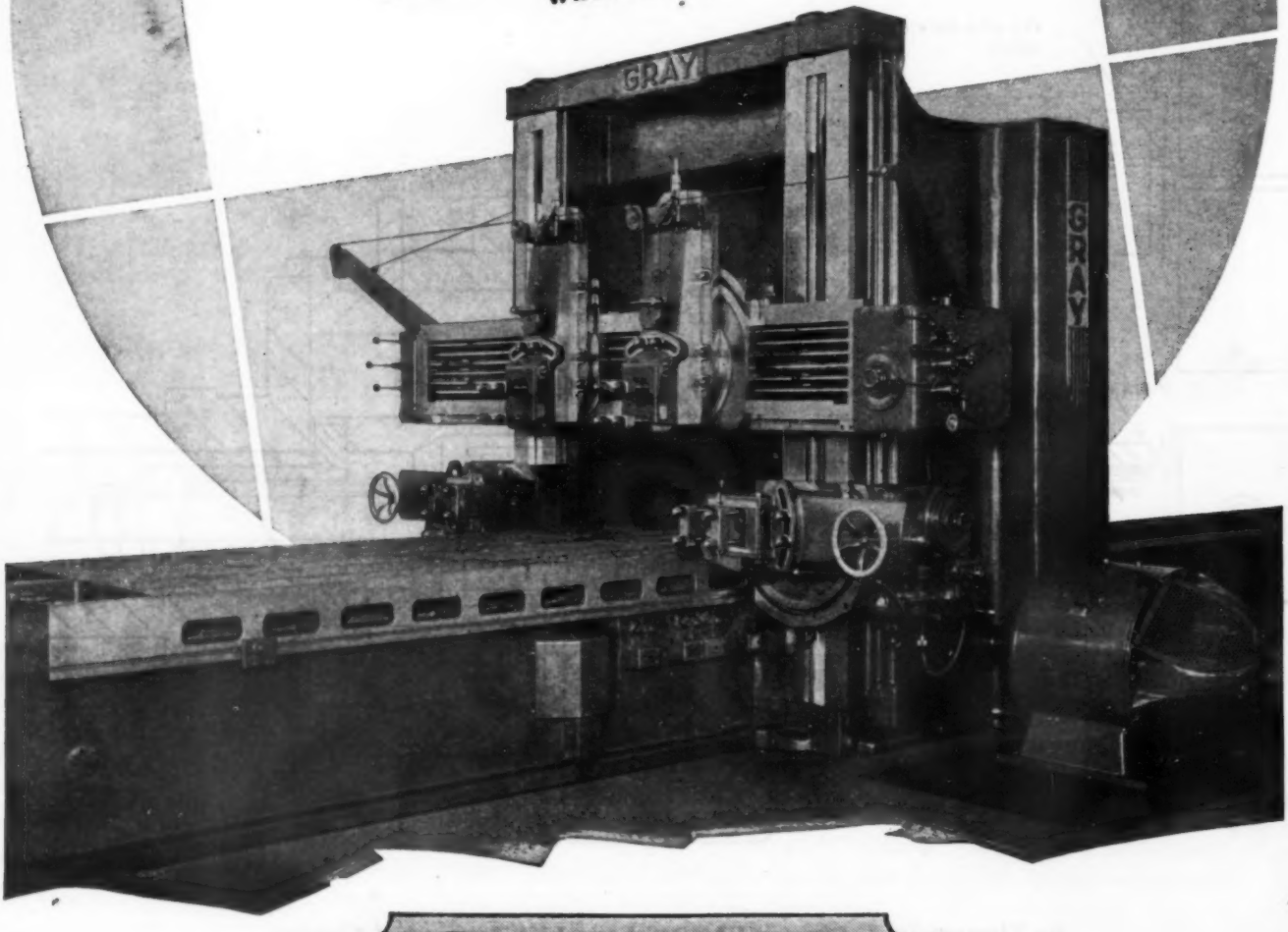
GRAY RAIL LOCK *requires no adjustment.*

● Year in and year out it grips both housings with equal force.

The operator of a Gray Planer can use the largest feeds and the highest speeds that the work and tools will stand, for he knows that his rail is always rigidly locked to both housings.

This is only one of the many features that give Gray planer hands confidence in their machines.

Write for bulletin 40-R. It tells the whole story.



THE G. A. GRAY COMPANY

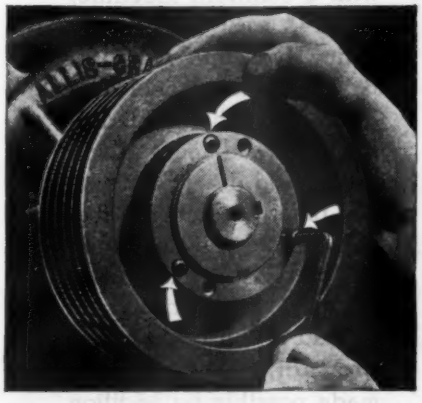
3610 WOODBURN AVENUE • • • CINCINNATI 7, OHIO, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

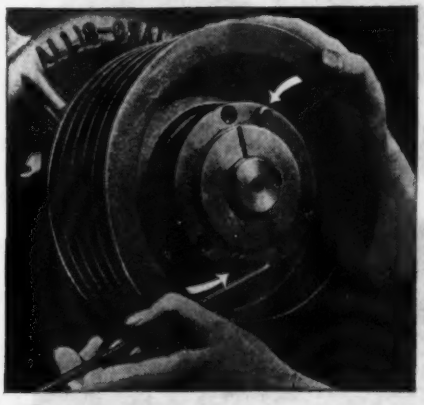
Changing was a job for but now could do it

No bulging muscles needed! Allis-Chalmers' new "Magic Grip" — *fastest mounting and demounting sheave on the market* — slides on and off *easily!*

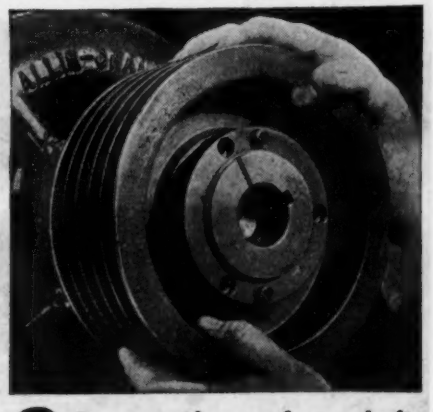
SEE HOW QUICKLY AND EASILY THIS SHEAVE COMES OFF THE SHAFT



1 **Remove three capscrews** from bushing collar. A handy wrench — supplied with each sheave — is the only tool needed to remove Allis-Chalmers' new "Magic-Grip" from motor or machine shaft quickly and easily.



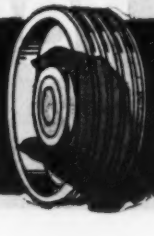
2 **Insert two capscrews** in tapped holes. As screws are turned, they become levers . . . automatically breaking tight grip of tapered split bushing on sheave and shaft. Entire unit is then ready for removal.



3 **Remove sheave from shaft.** Requires no mallet, no prying, no bulging muscles. You just slide the sheave off . . . smoothly, quickly. *It costs nothing extra!* Send for B6310. Allis-Chalmers, Milwaukee 1, Wis.

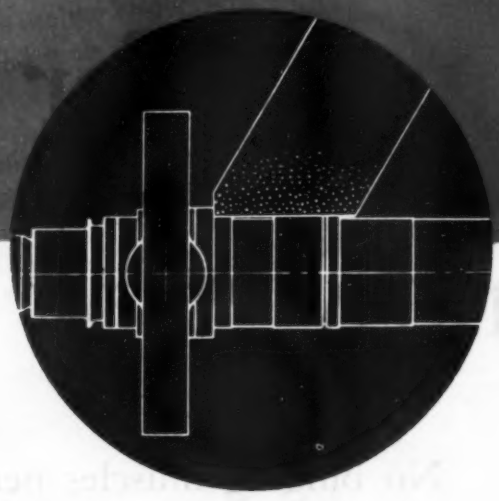
A 1856

Allis-Chalmers Texrope

"MAGIC-GRIP"  SHEAVES

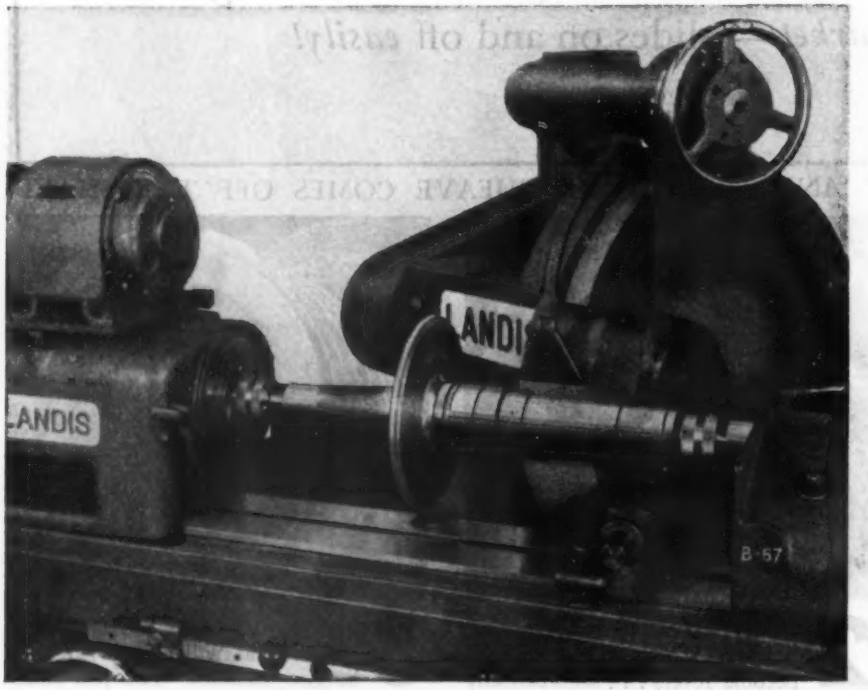
Grinding Time Cut 50%

ON STANDARD MACHINE WITH ANGULAR WHEEL BASE



The Problem

To reduce grinding time of shoulder, fillet and adjacent diameter on airplane propeller shaft. Conventional method of grinding diameter and then traversing wheel by hand to grind shoulder not fast enough for high production.



THE LANDIS TOOL SOLUTION

Our engineers started with a standard machine, the 14″ x 36″ Type CH Plain Hydraulic Grinder. By setting the wheel at a 30° angle, the shoulder, fillet and adjacent diameter could be ground at one time. Since the wheel base would interfere with the work, the wheel was mounted on the right side instead of the left. Further production gains were made possible by addition of the Landis Tool hydraulic rapid infeed for plunge grinding.

LANDIS TOOL
Precision Grinders

LANDIS TOOL COMPANY

Another Example of LANDIS TOOL *Engineered Grinding Service*

14″ x 36″ CH PLAIN GRINDER with 30° angle wheel base, right hand wheel mounting. Plus hydraulic rapid infeed, table type diamond holder for face dressing, table type side truing bar, ball bearing live work centers.

● Here is another production grinding problem where Landis Tool engineers combined two grinding operations by modifying a standard machine. As a result, grinding time was cut more than 50% and airplane propeller shaft production was increased. The solution to this kind of problem is typical of the help that you can get from Landis Tool to solve your grinding problems. Each problem is analyzed by engineers experienced in grinding production.

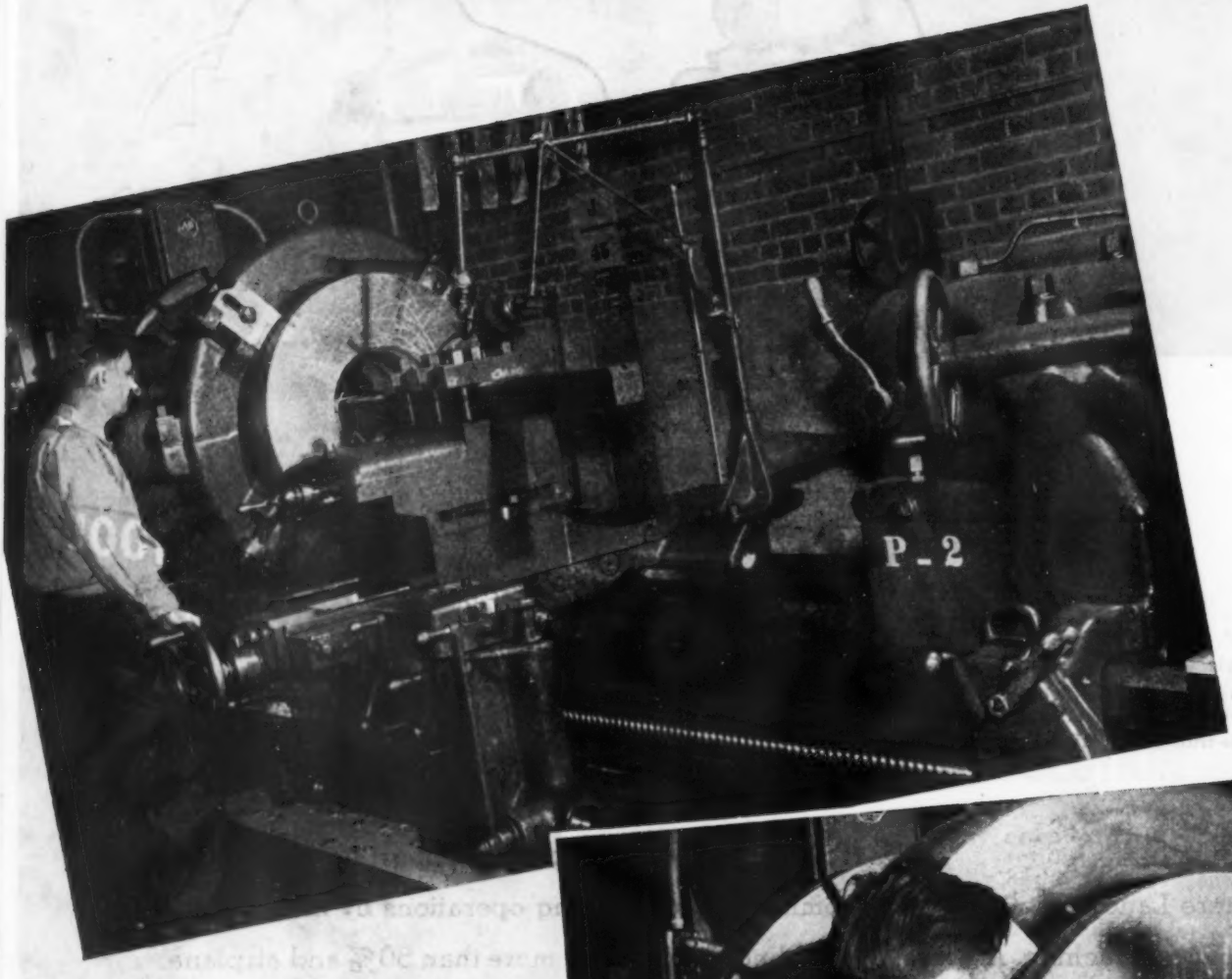
Our recommendation for your problem may involve modifying a standard machine or the building of special fixtures to get your production or tolerances. Call on us for Landis Tool engineered grinding service.

38

LANDIS TOOL *Company*

WAYNESBORO, PENNA.

Like all True A



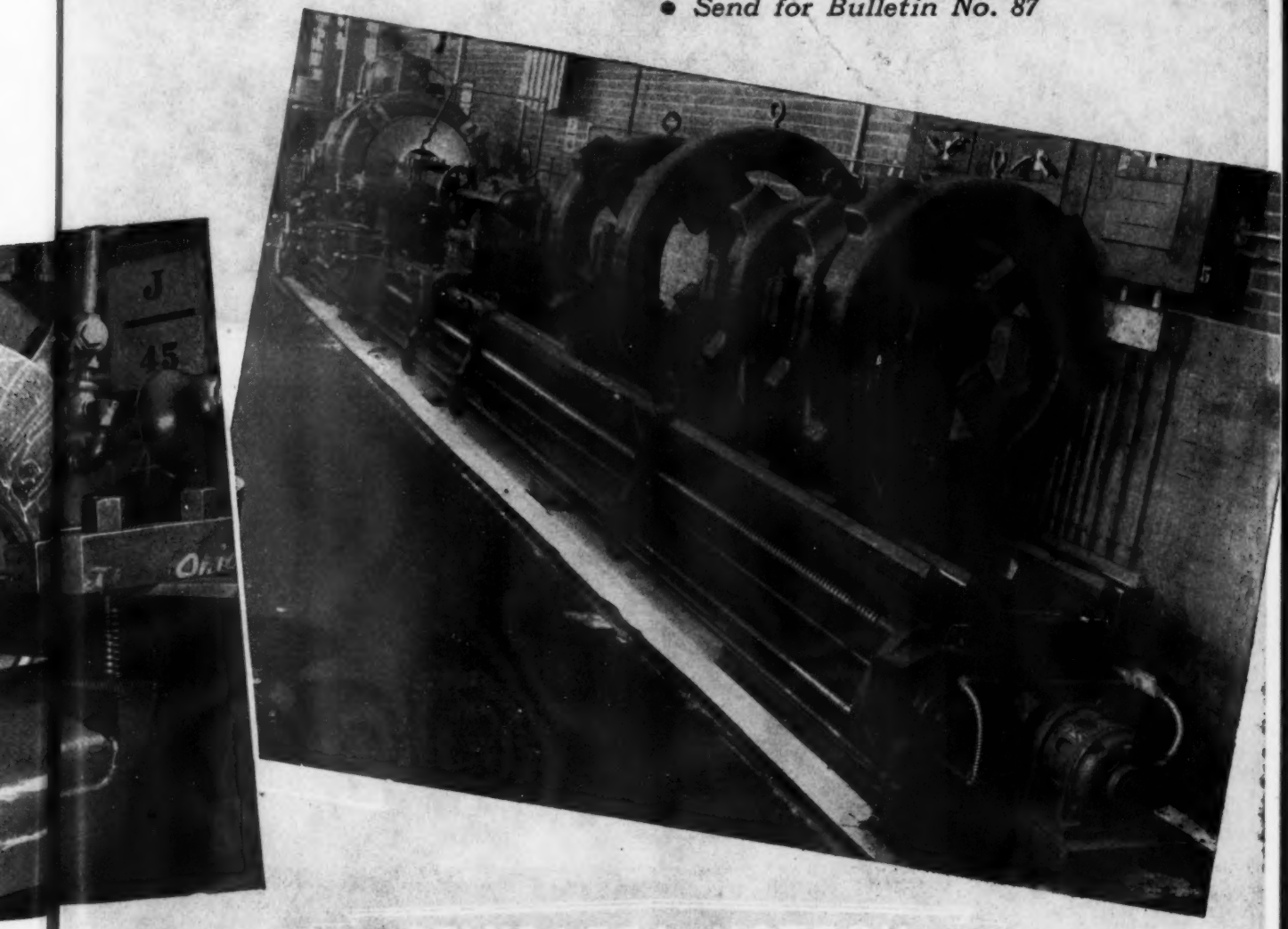
THE AMERICAN TOOL WORKS CO

AMERICANS...

"American" Lathes from the smallest to the largest are meeting the challenge of war production like all true Americans. The power, stamina and endurance built into "American" Lathes have proven invaluable to many a production plant operating on an around-the-clock-schedule. Dependable service, minimum shut-down for failures and repairs coupled with an almost unbelievable ability to "keep going" under any and all conditions are genuine "American" characteristics. "American" Lathes are easy to operate too—another feature that appeals to the operator as does their simplicity of design and complete freedom from complex mechanisms and manipulations.

"American" Lathes are an asset in any plant.

• *Send for Bulletin No. 87*



Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

FOR ALL TYPES OF

SURFACE GRINDING...

NORTON ABRASIVES

NORTON SEGMENTS

Stocked in All Commonly Used Specifications for All Popular Makes of Chucks

YES, you can get NORTON SEGMENTS right out of stock for nearly every surfacing job that you may have. They are available in sizes and shapes for all kinds of chucks and in a wide variety of specifications.

FIVE ABRASIVES — Alundum, 19 Alundum, 38 Alundum, 57 Alundum and Crystolon.

FOUR BONDS — Vitrified, BE Vitrified, Resinoid, Silicate.

OPEN STRUCTURE — Popular now for many surfacing jobs — especially where contact is broad or stock removal exceptionally heavy — are Norton OPEN STRUCTURE Segments. Their large pore space means bigger chip chambers and more room for coolant — gives a faster, cooler cutting action.

There's a Norton abrasive engineer near you. Let him study your surfacing jobs and specify the segments you should have — the abrasive, bond and structure, the grain size and grade.

NORTON COMPANY • WORCESTER 6, MASS.

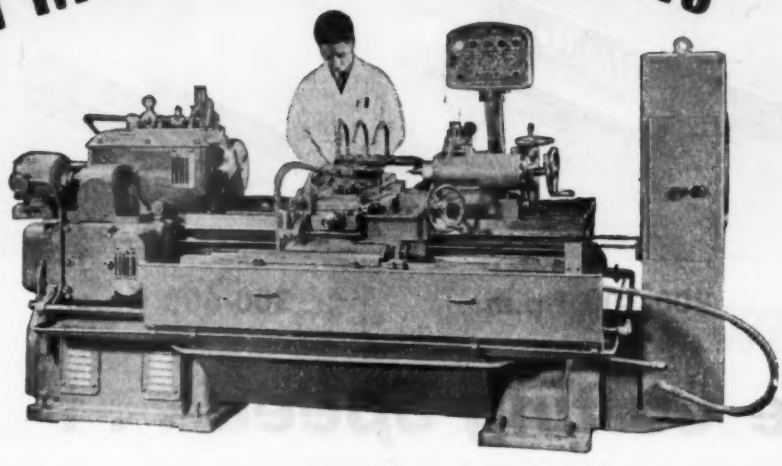
Distributors in All Principal Cities

W-1016

6 DIFFERENT FEED RATES ON 1 AUTOMATIC CYCLE... help remove metal faster

Cabinet within easy reach of operator houses electric controls permitting automatic selection of six different feed rates of Monarch Magnamatic. Thus feeds can be adapted to exact requirements, either for faster metal removal or for varying the finish on different portions of the work. Operation is completely automatic throughout the cycle—start of which is controlled by pushbutton on panel within arm-reach of operator.

on Monarch Magnamatic



This feature alone makes the Magnamatic a profitable investment for a wide variety of automatic turning, boring or facing work. Add to it the advantages of exceptionally fast setup (as described, at right) and you can see why Magnamatics have been so successful in peace and war production over the past ten years.

For runs as short as 25 pieces, this fully automatic, double carriage, all-electrically controlled machine will show amazing cost reductions. For long runs, the savings are still more substantial. A 10-year record for successful operation proves the time and cost-saving ability of the Magnamatic.

Ask our nearest representatives for complete information and suggestions on how you can utilize the Magnamatic to cut costs on turning, boring or facing work.

THE MONARCH MACHINE TOOL CO. · SIDNEY, OHIO

DIRECT FACTORY BRANCHES

CHICAGO 6, ILLINOIS
622 W. Washington Blvd.
Phone: Randolph 4295

CLEVELAND 6, OHIO
Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 2650

NEWARK 2, NEW JERSEY
635 Industrial Office Bldg.
Phone: Mitchell 2-1770

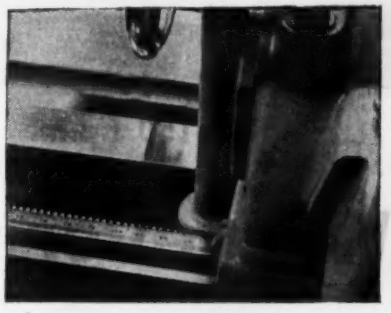
PITTSBURGH 22, PENNSYLVANIA
512 Empire Building
Liberty Ave. and Stanwix St.
Phone: Atlantic 6428

Representatives in Principal Cities

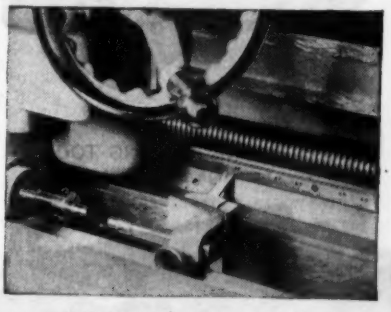
Monarch Saves Time

REMARKABLY QUICK SETUP MAKES SHORT RUNS PROFITABLE

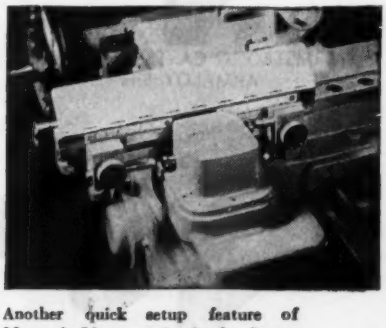
With setup time as low as five minutes in many cases, the Monarch Magnamatic is especially valuable for short runs—profitable even down to 25 pieces. Convenient handwheels and micrometer adjustments provide quick and accurate setup facilities.



Scale and pointer on tailstock for ready positioning of tailstock for various lengths of work. This eliminates necessity of repositioning on setup.



Quick positioning of stops controlling the longitudinal travel of carriage is provided by scale pointer with micrometer finger-tip adjustment.



Another quick setup feature of Monarch Magnamatics is the finger-tip control of travel to the slides, provided by this easy-reading and accurate micrometer adjustment.

ARMSTRONG

100-150 f.p.m. **200-300 f.p.m.** **300-600 f.p.m.**

Whatever the Cutting Speed . . .

ARMSTRONG TURNING TOOLS
for High Speed Bits

ARMSTRONG CA Tool Holders for
ARMALOY Bits

ARMSTRONG Tool Holders
for ARMIDE Cutters

Whatever cutting speed an operation calls for there is a correct ARMSTRONG TOOL HOLDER that takes the proper bits, blades or cutter to do the operation economically and efficiently.

ARMSTRONG HIGH SPEED

For general tool room and machine shop use ARMSTRONG HIGH SPEED Bits and Blades are unsurpassed. They will stand up to speeds and feeds far greater than those generally accepted as "standard".

ARMALOY

ARMALOY Bits and their corresponding ARMSTRONG CA TOOL HOLDERS are recommended for machining sand-fitted castings, malleable iron, non-ferrous metals, rubber, plastics and for machining steel on modern high production machines, where sufficient speed and feed can be obtained to take advantage of their greater cutting capacity.

ARMIDE

ARMIDE Carbide-Tipped Cutters and ARMSTRONG Carbide Tool Holders, make the use of Carbide-tipped tools practical in even the smallest shop. Coming in two grades ARMIDE Red (for steel) and ARMIDE Gray (for cast iron, brass, aluminum and non-ferrous materials). They easily machine hard and tough steels, and stand up to the highest speeds and heaviest feeds, and increase the interval between tool re-grindings as much as 10 to 50 times.

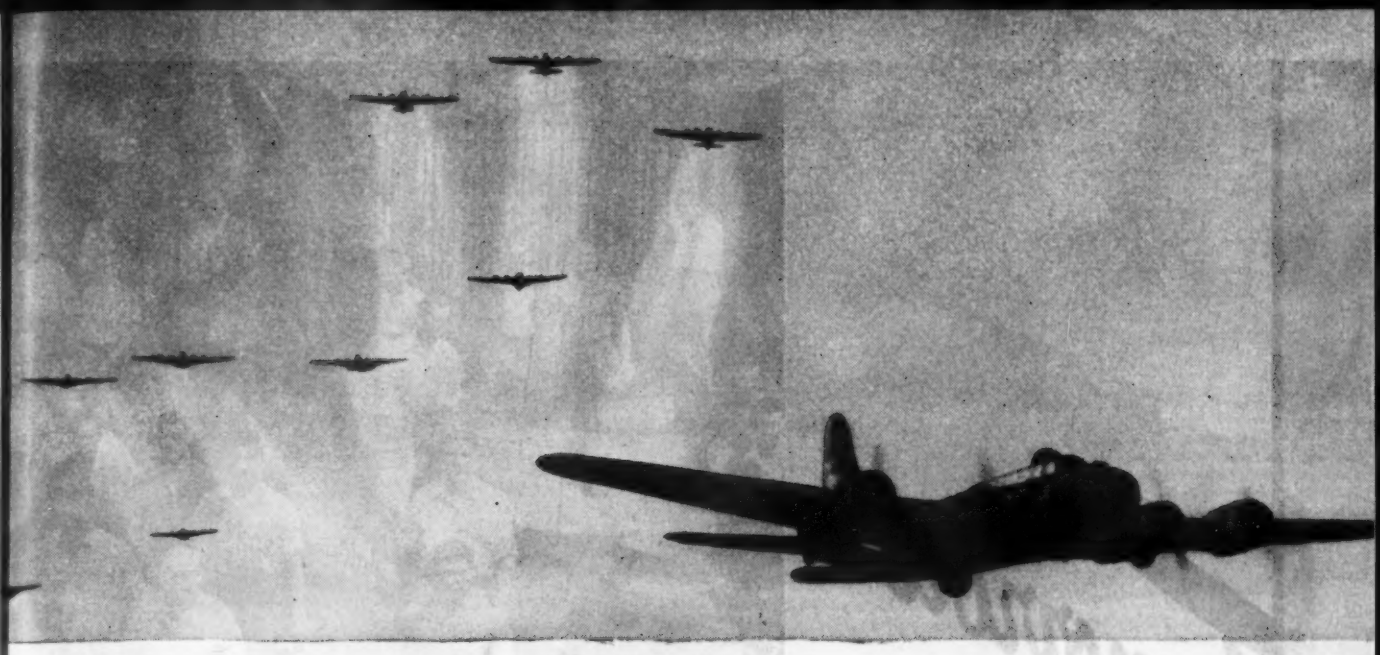
ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVENUE **CHICAGO 12, U. S. A.**

Eastern Warehouse & Sales: 199 Lafayette St., New York 12, N. Y.
Pacific Coast Warehouse & Sales Office: 1275 Mission St., San Francisco 3, California

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms



SO ENGINES CAN "BREATHE" IN THIN AIR

● To supply enough air for high powered engines to "breathe" normally in the rarefied atmosphere of high altitudes, these turbo superchargers operate at a speed of about 26,000 r.p.m. At this speed, one ounce inch of unbalance will produce a centrifugal force of 1200 pounds! The need for extremely accurate balance is imperative—to eliminate vibration—to insure the life of supporting bearings—to prevent failure.

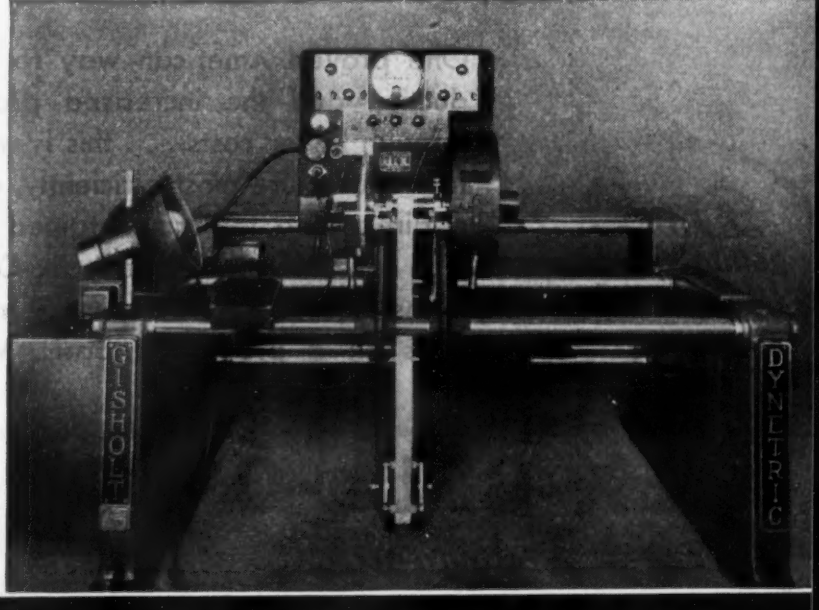
DYNETRIC BALANCING* is the answer to this problem as it is wherever the finest degree of static and dynamic balance is required. Here again, Gisholt Dynetric Balancing Machines *locate* and *measure* unbalanced forces with a degree of speed and accuracy that is not possible by any other means.

Today, the principle used in Gisholt's Dynetric Balancing is applied to practically every kind of rotating part weighing anywhere from ½ ounce up to 50 tons. Complete information is available upon request.

**A development of Westinghouse Research Laboratories.*

Turbo supercharger assemblies are balanced to an accuracy of 0.1 gr. of weight. To accomplish this, the balancing machine weighs a 1/228,000 part of the total weight of the assembly while it is rotating at 2200 r.p.m.

GISHOLT MACHINE COMPANY
1102 East Washington Avenue
Madison 3, Wisconsin

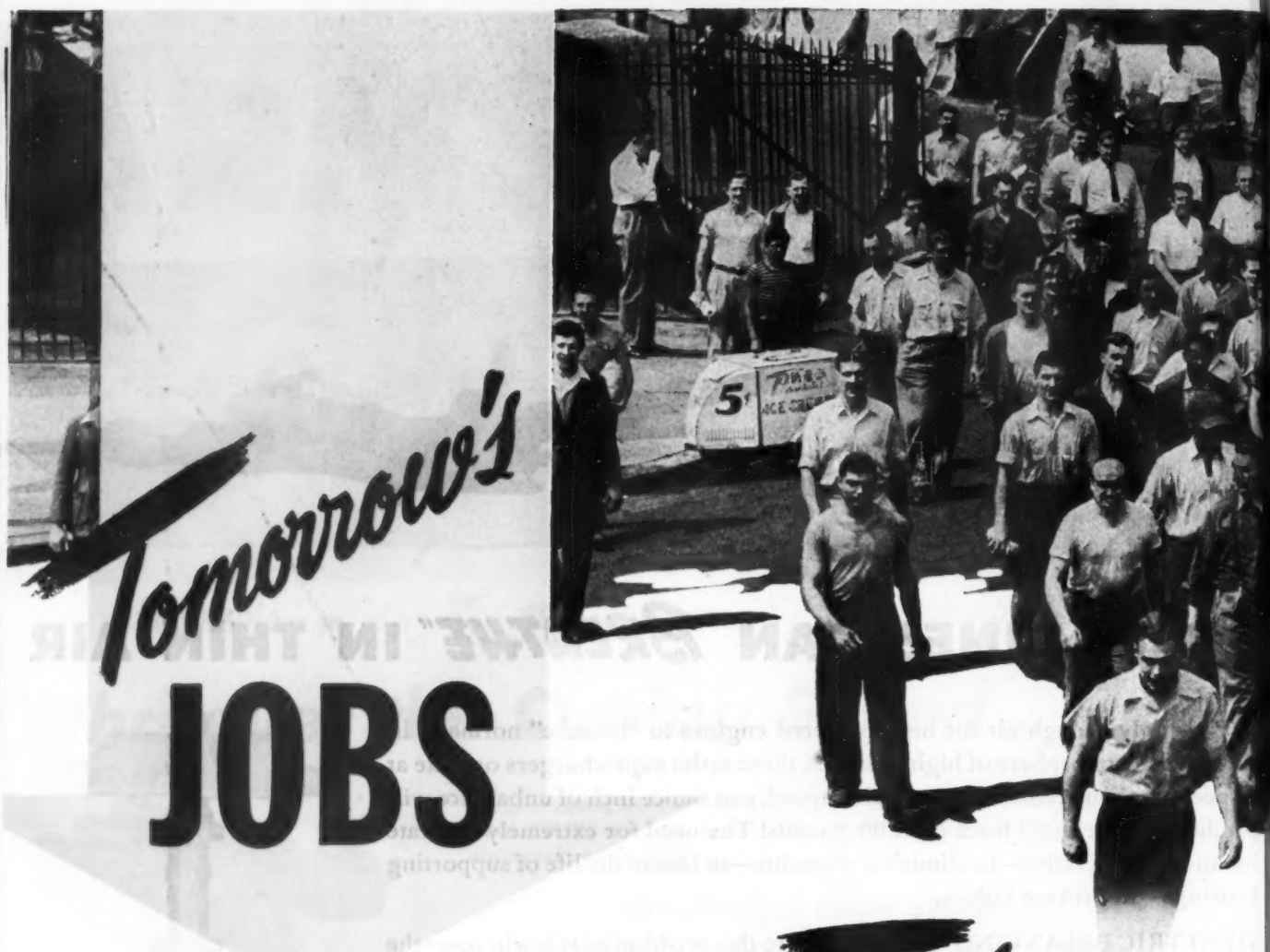


Balancing turbo superchargers on a Gisholt Type 3S Dynetric Balancing Machine. To reduce the horsepower required to drive the assembly, the impeller, or fan, is enclosed in a shroud so that it cannot pump air.

GISHOLT

Look Ahead . . .
Keep Ahead . . .
with Gisholt

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES



Tomorrow's JOBS MEAN PLANNING *Today . . .*

Let EX-CELL-O's Complete Parts Manufacturing Facilities Help Keep Your Assembly Lines Rolling

One proved American way to more jobs is efficient production and the increased product demand that comes through lower costs . . . this is why definite planning today to manufacture most efficiently, economically and quickly is a direct step toward sustained business prosperity and a high level of employment. Ex-Cell-O can help you if your plans call for accurately-made metal parts and sub-assemblies on a production basis. Write to Ex-Cell-O today.

Don't gamble with your future product . . . plan to use XLO PARTS

EX-CELL-O CORPORATION

XLO

EX-CELL-O for PRECISION

EX-CELL-O's *facilities:*

PRODUCTION ENGINEERING

The Ex-Cell-O organization, with skill, facilities and modern methods that have made a wartime record, can make an important contribution in the planning of quantity production of quality parts and unit assemblies for your postwar product.

HEAT TREAT

- Induction Heating
- Laboratory for Heat Treat Control including Micro Examination and Photography
- Atmosphere Control Continuous Hardening Furnaces
- Atmosphere Control Box Hardening Furnaces
- Various Types of Air-Draw Batch Type Furnaces
- Gas Carburize Furnaces
- Box Carburize Furnaces
- Pack Anneal Furnaces
- Nitriding Furnaces
- Cyanide, Lead, and Neutral Salt Pot Furnaces
- High Speed Steel Atmosphere Control
- Vertical and Horizontal Hardening Furnaces
- Continuous Air-Draw Furnaces
- Sub-Zero Heat Treating Equipment

PRODUCTION MACHINES

- Multiple Vertical Turret Lathes
- Multiple Spindle Automatic Screw Machine
- Single Spindle Automatic Screw Machines
- Hand Screw Machines
- Centerless Grinders
- Single and Multiple Spindle Drilling Equipment
- Plain O.D. Grinders
- Plain I.D. Grinders
- Milling Machines
- Broaching Machines
- Precision Thread Grinders
- Precision Boring Machines
- Lapping Machines
- Special High Production Equipment

UNIT ASSEMBLIES

For many years Ex-Cell-O has supplied large and small manufacturers with parts and has also supplied many parts in unit assemblies after machining, heat treating and grinding.

INSPECTION

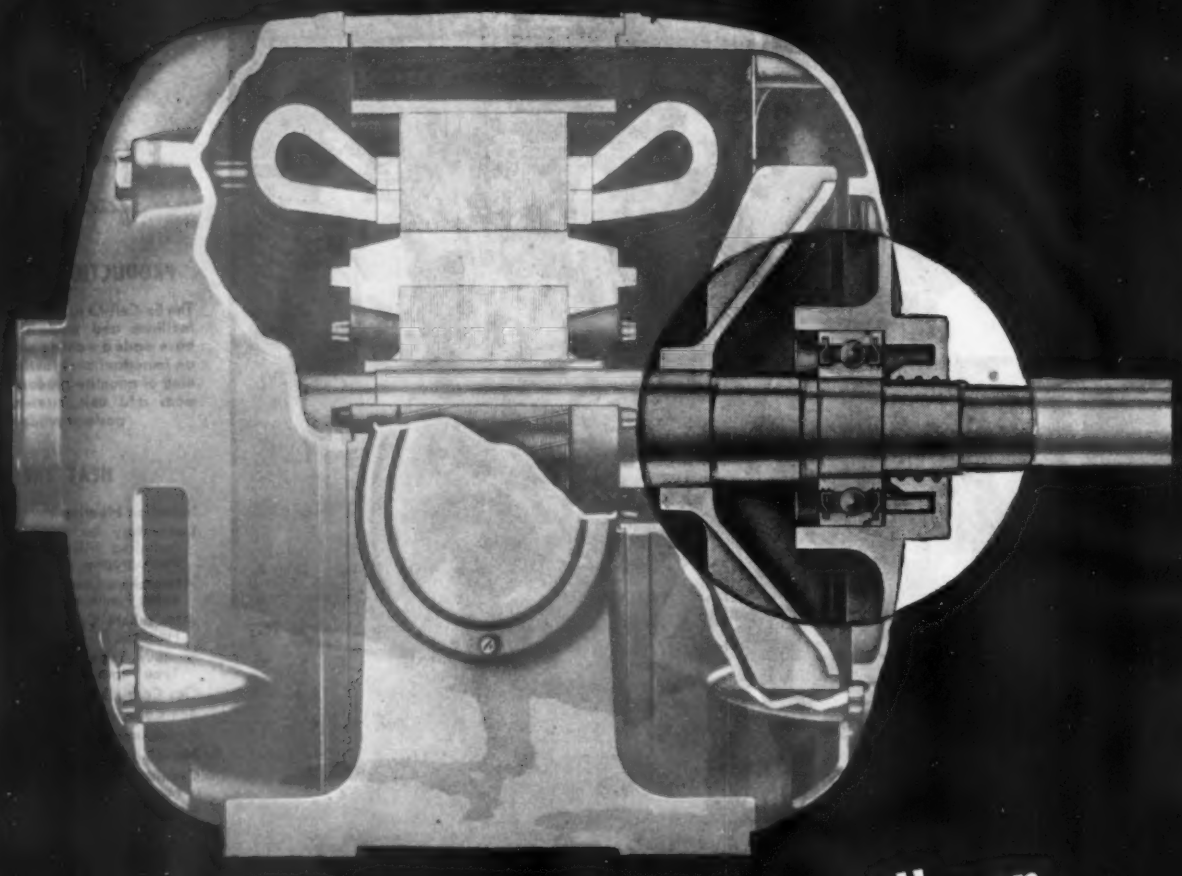
Ex-Cell-O has always maintained that quality in a product is not the result of accident; that quality is built into a product by rigid adherence to accepted quality standards . . . standards that are upheld at Ex-Cell-O by efficient inspection at every step of the machining process.

Above: If you do not now receive Ex-Cell-O TOOL TIPS, devoted to precision, speed and economy in production, send your name, company, address, and position to Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit 6.

One of the numerous inspection departments in Ex-Cell-O Miscellaneous Production Parts Division

DETROIT 6, MICHIGAN

45—75



these Westinghouse motors will run
twenty-four hours a day—
for five years or more—
with no greasing

eliminates frequent bearing lubrication

THE BIGGEST ITEM OF MOTOR MAINTENANCE

Another great step forward in the design of squirrel-cage motors of 15 horsepower and under (frames 326 and smaller) is being offered by Westinghouse. It's the Prelubricated Ball Bearing.

Instead of the periodical lubrication required by the bearings in conventional motors, the lubrication of these bearings can be forgotten for five years or more, even *when operating 24 hours a day.* The saving in time of maintenance crews is obvious, but there are other important advantages, too:

No overgreasing
No "skipped" bearings
No grease contamination
No grease seepage
No unreplaced pipe plugs

All these add up to longer bearing life and smoother motor operation through years of continuous service. For complete information, write for Bulletin B-3554 and Descriptive Bulletins 3100-CSP and 3100-1 to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21342

TYPE CS MOTOR

TYPE CSP MOTOR

WESTINGHOUSE SPECIAL FEATURES

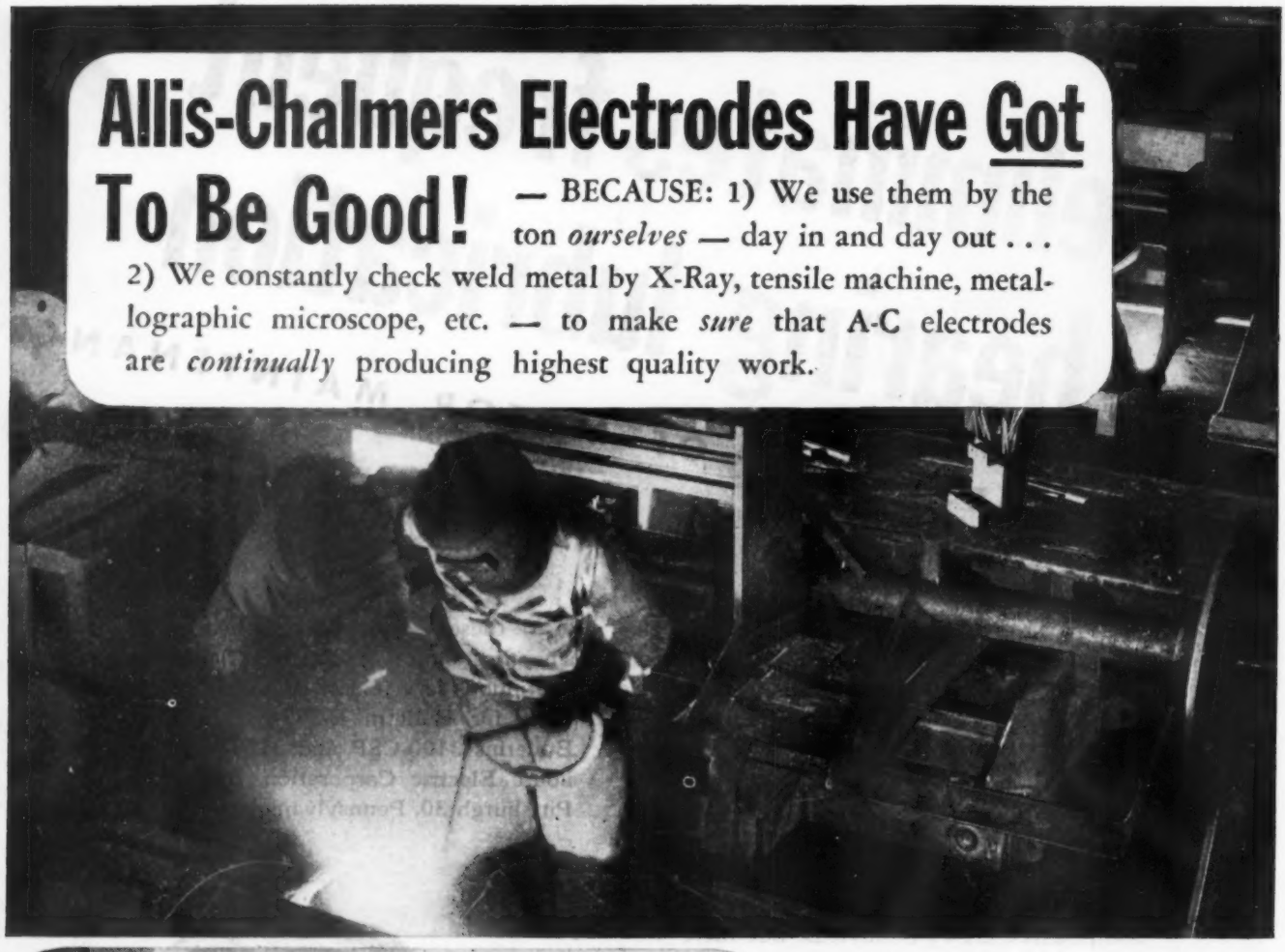
- **PRELUBRICATED SEALED BALL BEARINGS** reduce lubrication maintenance . . . assure longer grease life . . . eliminate extensive lubrication records.
- **IMPROVED TUFFERNELL INSULATION.**
- **DYNAMICALLY BALANCED ROTOR.**
- **DIE-CAST ROTOR** with over-size fan.

Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

WESTINGHOUSE SQUIRREL-CAGE MOTORS

Allis-Chalmers Electrodes Have Got To Be Good!

— BECAUSE: 1) We use them by the ton *ourselves* — day in and day out . . . 2) We constantly check weld metal by X-Ray, tensile machine, metallographic microscope, etc. — to make *sure* that A-C electrodes are *continually* producing highest quality work.



1 Allis-Chalmers supplies to industry the world's greatest variety of capital goods—over 1600 types of products. Skilled workmanship by thousands of welding operators plays an important part in that record. And *tons* of Allis-Chalmers electrodes are used every day—in such A-C shops as above—to turn out this massive production. Since A-C's *own* weld production hinges on the uniform quality of these electrodes you can see that *they've got to be good!*

2 One of the typical tests Allis-Chalmers sample welds undergo is inspection on this metallographic microscope. Minute details can be enlarged up to 12,000 diameters—enabling *accurate* study of weld metal structure. With the constant aid of modern research equipment such as this, Allis-Chalmers makes *sure* that A-C electrodes are *made* right—and *perform* right. Try them on *your* next welding job. Our nearby district office or welder dealer can supply you.

A 1810

ALLIS-CHALMERS, MILWAUKEE 1, WIS.

A-C Electrodes
EASY TO REMEMBER
EASY TO BUY
Sold by AWS Number

HEADQUARTERS FOR WELDING EQUIPMENT

AMPAC A-C WELDERS

WELD-O-TRON D-C WELDERS

ARC WELDING ACCESSORIES

The "Priceless" Ingredient of CONTINENTAL Cutting Tools...

EXPERIENCE

IN the practical work of production, there is no substitute for experience. For twenty-six years Continental Tool Works has been designing and producing special and semi-standard cutting tools to customers' drawings or part prints . . . the Continental name in the cutting tool field is now used as another word for "accuracy and quality". This long experience, coupled with the most modern and complete facilities, makes Continental the first choice as a cutting tool source. Find out how Continental can help assure you of high production efficiency. Get in touch with Continental Tool Works, or its local representative.

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 6, MICHIGAN

45—65

CONTINENTAL TOOL WORKS — CTW — EX-CELL-O CORPORATION

Continental

CUTTING TOOLS

- Boring Bars and Tools
- Broaches
- Broach Pullers
- Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

CLEVELAND

Open Back

GAP PRESSES

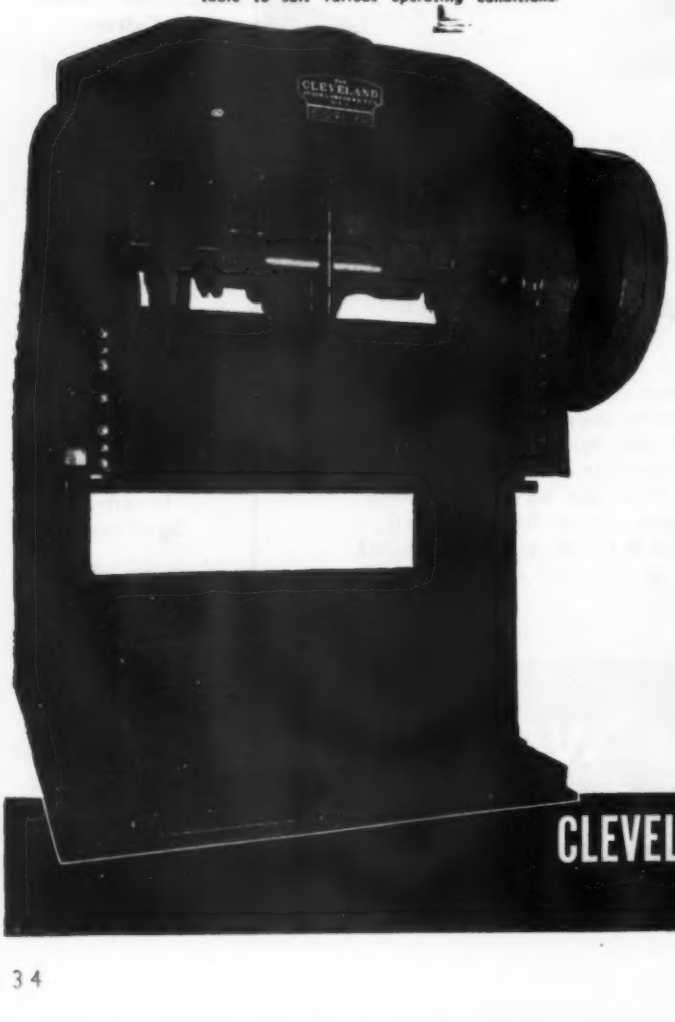
Standard Double Crank Open Back Gap Press equipped with an electrically controlled, hydraulically operated friction clutch and brake.

Cleveland Open Back Gap Presses are recommended for the very great convenience which this type of frame affords in the handling of large or irregular shapes and for feeding strip stock right and left across the dies.

These Presses embody all of the essential features of the standard Straight Sided Presses, the principal difference being in the design of the housings, which are cut back, and while the frames are ruggedly constructed and designed to withstand their maximum load without the use of tie rods, provision is made to permit the use of rods if desired.

Cleveland Single and Double Crank Open Back Gap Presses are built in a very wide range of standard sizes and can be modified in respect to stroke, adjustment, bed area, etc. to suit particular requirements.

Cleveland Double Crank Gap Press having a flush front which permits the use of a table to suit various operating conditions.



Single Crank Gap Press, permanently inclined to permit gravity discharge of the finished pieces. This is a modification of the customary upright position.

CLEVELAND PUNCH & SHEAR WORKS CO.

CLEVELAND 14, OHIO

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

A mathematical method for exactly determining the shapes of cams has been worked out by two university professors. *Carver & Quinn, Cornell Univ.*

get ready with CONE for tomorrow

Reverse-cycle heating is in actual use. In principle it consists in taking heat from the outside air (even the coldest air has some heat in it) and concentrating it for use indoors. Even better results may be had by using the heat in ground water from deep artesian wells. Where electricity is cheap, it seems to be a practical method as the only cost is the operation of the pump. *Science Digest.*

get ready with CONE for tomorrow

Plastic records used in a new electronic dictation machine are claimed to be so thin and flexible that they may be folded and mailed. *Sound Scriber Corp.*

get ready with CONE for tomorrow

A new method of spraying airplane "dope" uses heat instead of thinner to liquefy the material. *Sherwin-Williams.*

get ready with CONE for tomorrow

One city is investigating the possibility of an 8-mile subway in which passengers would be carried by an endless conveyor belt. *Detroit.*

get ready with CONE for tomorrow

Water, nearly equivalent to distilled water in purity, may now be produced by passing through filters made of synthetic resins. After continued use, the filters may be renewed by flushing. *Resinous Products Chemical Co., Philadelphia.*

get ready with CONE for tomorrow

One of our airlines plans to inspect its planes by X-ray at 750 hour intervals in order to reveal hidden weakness or failure. A portable X-ray machine will be used and 4 to 5 days will be required to take the 352 shots believed to be necessary. *Air Transport.*

One factory, serving 18,000 meals per day, believes that the day of the lunch pail is over. *Sperry Gyroscope.*

get ready with CONE for tomorrow

One of the largest printing press manufacturers announces a postwar press to produce newspapers with 4 colors on all pages. *R. Hoe & Co., Inc.*

get ready with CONE for tomorrow

High-nickel alloy tubes can now be made in sizes up to 11 in. diameter by extrusion. *International Nickel.*

get ready with CONE for tomorrow

A new high speed motion picture camera takes 8,000 pictures per second. When projected at normal speed, the result is a slowdown of 500 to 1. *Bell Telephone Laboratories.*

Chemists expect that fish may become more important as a source of industrial chemicals than as food. Already substances have been isolated that appear to be useful in paints, inks, lacquers, plastics, photographic papers, adhesives and medicines. *Business Week.*

get ready with CONE for tomorrow

A Cuban inventor has received a patent for the production of alcohol by continuous flow. *Patent 2,371,208.*

get ready with CONE for tomorrow

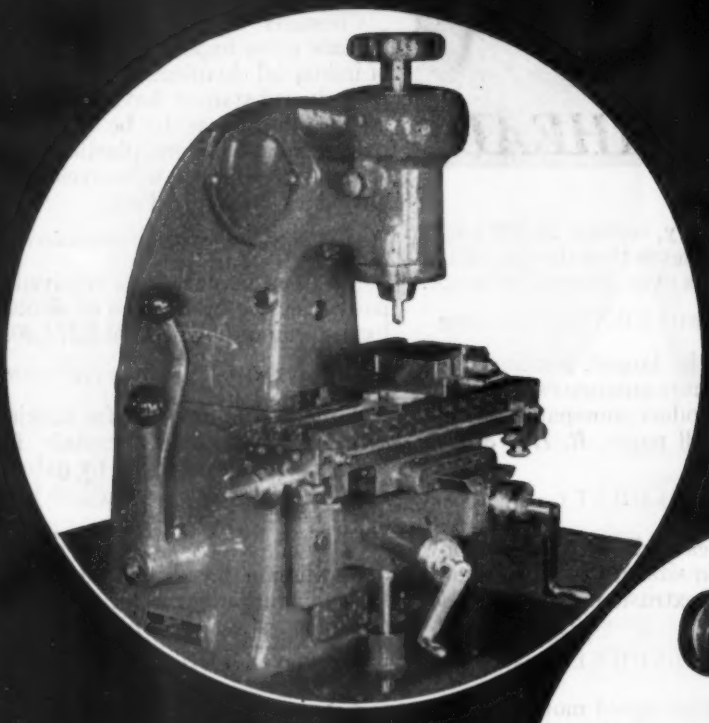
A method is reported for making synthetically optical crystals far larger than any produced by nature. *Polaroid Corporation.*

get ready with CONE for tomorrow

Permission has been granted to build a station for color television experiments. *Zenith Radio.*

get ready with CONE for tomorrow

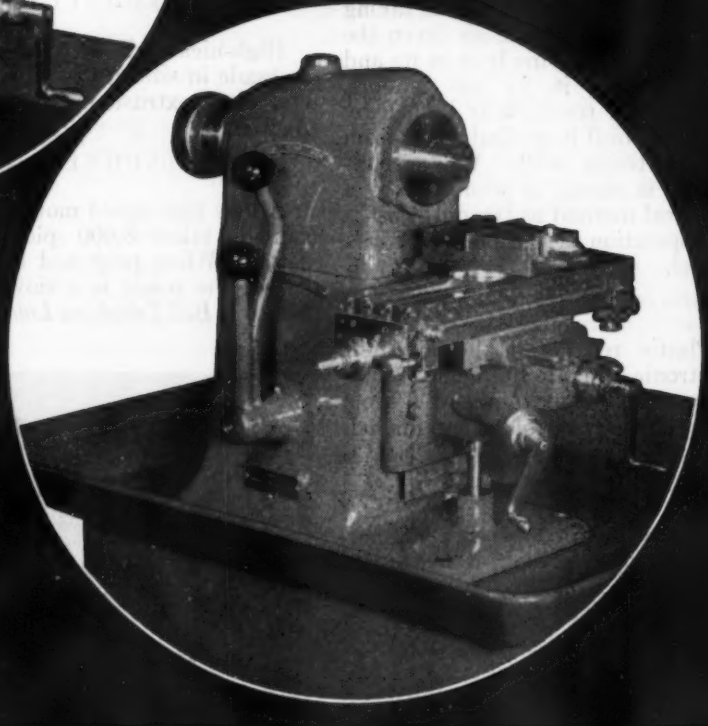
A large manufacturer of railroad cars expects that 27,000 of the country's 30,000 railway passenger cars will have to be replaced after the war. *Pullman-Standard.*



HARDINGE
ELMIRA, N.Y.

BB2V

Table: 12" x 3-3/16"
Eight Speeds: 300 to 5000 R. P. M.
Vertical Head has 1/2" Collet Capacity



BB4

Table: 12" x 3-3/16"
Eight Spindle Speeds:
180 to 3000 R. P. M.
Cutter and Index Heads
have 3/4" Collet Capacity

HARDINGE
HIGH SPEED PRECISION MILLING MACHINES

CORRECT SIZE. Closer proportion in the size of a machine tool to the size of the work means greater economy in the original investment and in the cost of the parts produced.

These HARDINGE Precision Milling Machines are small, compact machines designed to do a volume job on small parts, thus releasing large equipment that is too cumbersome for small work in production, tool room or development departments.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

LIKE TO PICK YOUR OWN *Diamonds?*

Get a selection from Wheel Trueing's big stock . . . choose those you want and get exactly the kind of diamonds you prefer.

While the introduction of highly specialized engineered diamond tools (which Wheel Trueing pioneered) has done much to change buying habits, there are still plenty of diamond-wise production men, purchasing agents and heads of grinding departments who thoroughly understand the characteristics of diamonds, who are competent buyers and who still prefer to select unmounted stones.

Many of these experienced buyers have bought their diamonds from Wheel Trueing for a third of a century or more and in many instances leave the selecting of diamonds for their needs entirely in the hands of Wheel Trueing.

With Wheel Trueing sales offices located strategically throughout the country, it is an easy matter for us to get diamond assortments to you for your inspection and selection and you will find in every Wheel Trueing diamond assortment, the high quality that results in worth-while production economies.

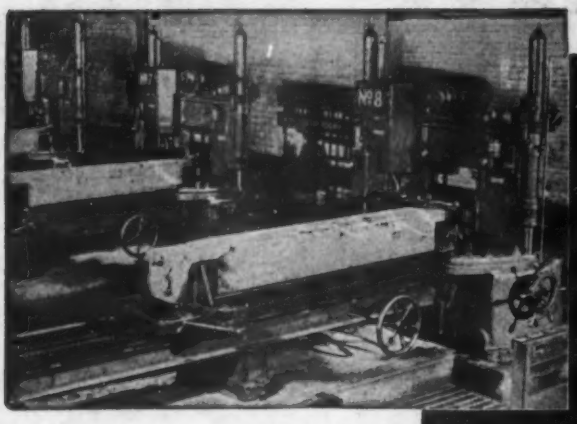
Your inquiry will receive prompt attention.

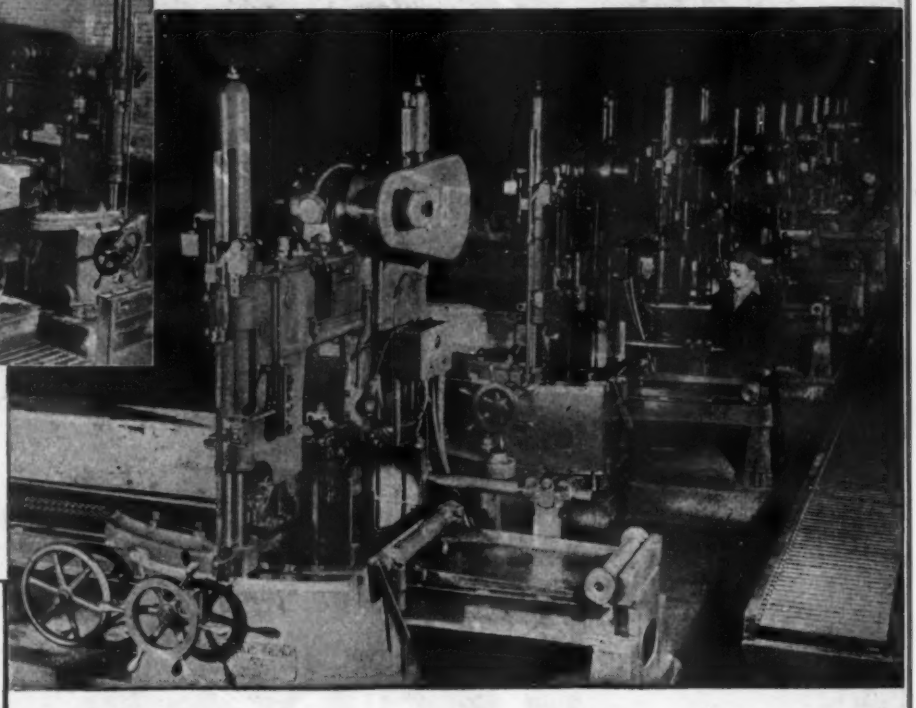
Send for a copy of our booklet "Tips on Using Diamond Tools." You'll want copies for all your operators.

WHEEL TRUEING TOOL COMPANY

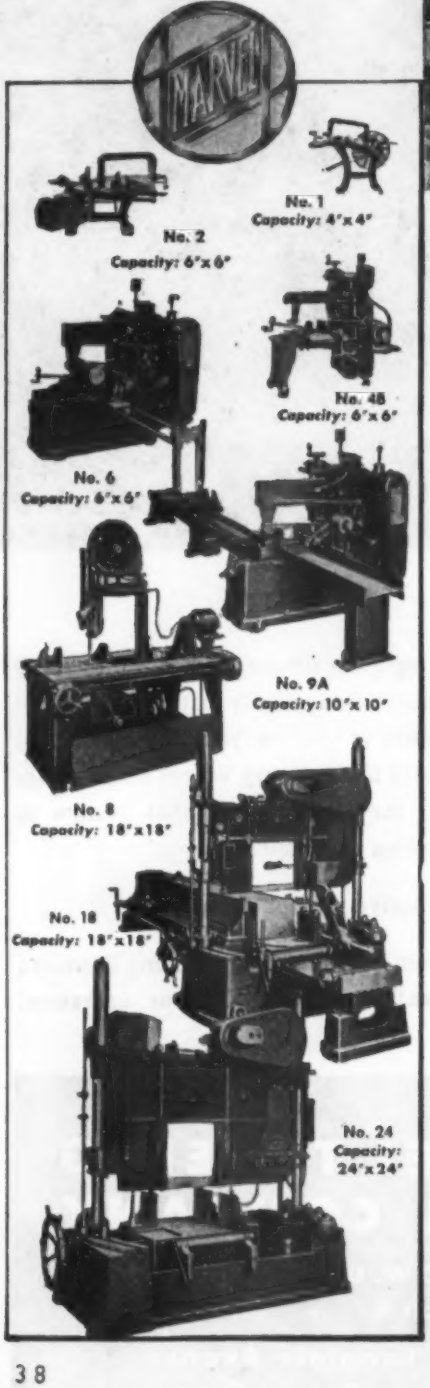
3200 W. Davison Avenue
Detroit 6 • Michigan

575 Langlois Avenue
Windsor, Ont. • Canada





Part of the row of No. 18 MARVEL Giant Hydraulic Hack Saws used to crop and cut-off test slices for metallurgical tests for large billets of tough alloy steels.



MARVEL No. 18 Hydraulics 12 in a row!

When a greatly expanded steel plant, near Canton, Ohio faced the problem of cropping and cutting-off test samples from large alloy billets, in WARTIME quantities and at wartime speed, they checked the performance of all types of cutting-off equipment in all their other company plants, and selected MARVEL No. 18 Giant Hydraulic Hack Saws for this "tough" job.

Now this row of twelve MARVEL No. 18 Hydraulics shown above, operating continuously, 24 hours a day on tough alloy billets of from 14" to 16" cross section, handle this tremendous, heavy duty cutting-off job without a hitch and with a minimum of man hours—only four operators per shift.

When you have a cutting-off problem your most logical first step is to check with your local MARVEL Sawing Engineer for recommendations of methods and equipment.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. BLOOMINGDALE AVE. CHICAGO 39, U. S. A.

Eastern Sales Office: 225 Lafayette St., N. Y. 12.

MARVEL SAWS

Making invasion pipe on Yoder Tube Mills equipped with Timken Bearings.

Arteries of Victory

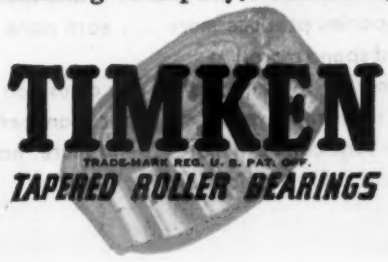
Now it can be told that one of the most potent of our "secret weapons" in downing the Nazis was the invasion pipe line.

Following the invasion forces across the English Channel; across France, Belgium and Holland; across the Rhine and into Germany itself; these pipe lines were truly "Arteries of Victory"—for they conveyed the fluids that represent the life-blood of modern mechanized armies—gas and oil.

American productive genius, represented in this instance by the Yoder Company, Cleveland, Ohio, designed and built the mills upon which the invasion pipe is made, and turned out 1200 miles of invasion pipe in its own plant. The pipe is produced by forming and welding steel strip in a continuous operation.

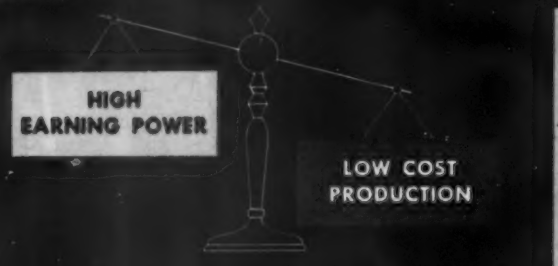
The Yoder Company has designed and manufactured continuous tube mills for many years and has used Timken Tapered Roller Bearings in them consistently to prevent friction; promote speed; protect against radial, thrust and combined loads; preserve alignment; and increase endurance.

You need Timken Bearings in your equipment to give it modern performance. Make sure you have them—and remember every genuine Timken Bearing has the trade-mark "TIMKEN" stamped on the cup and cone. The Timken Roller Bearing Company, Canton 6, Ohio.



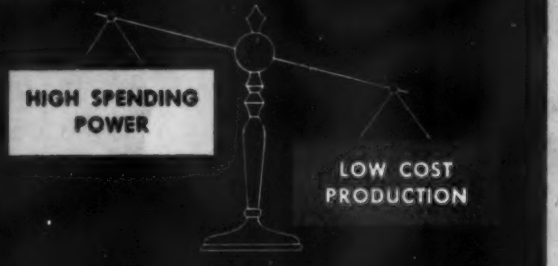
Everybody and Every Company Has TWO BASIC POWERS—

EARNING POWER

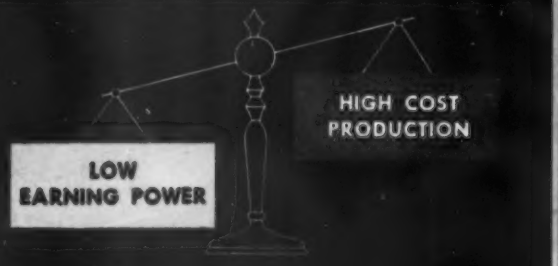


High earning power brings high volume demand for goods—stimulates efficiency, increases unit production, resulting in lower cost production.

SPENDING POWER



High spending power brings lower cost production because it stimulates keener competition and the use of efficient machinery and methods. Low cost production means more goods—higher standards of living.



Low earning power can lead only to lowered efficiency and high cost production because it means diminishing demand for goods, low volume, less efficient production.

Low spending power causes higher cost production, because the lower demand for goods makes it impossible to take full advantage of the making of more goods at lower cost.

SPENDING POWER—*Is the Key to Security Through Full Employment*

Dollars . . . in any quantity at any time . . . are beneficial only when they are in use . . . being spent. Dollars in use . . . being spent . . . provide jobs . . . security . . . prosperity . . . higher standards of living.

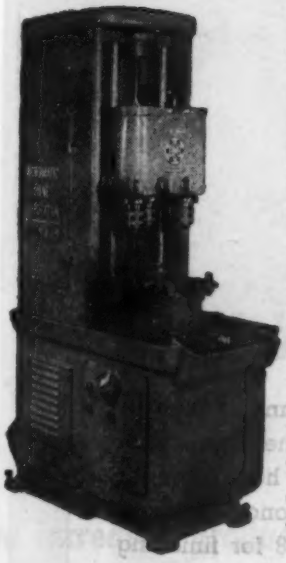
Obviously, individual spending power depends on each man's earning power . . . and his earning power can increase only as he is enabled to produce more. Only when the individual earns more and spends it . . . can companies produce more . . . earn more . . . hire more and spend more.

The only post war plan that any of us can depend upon is to increase production per man per hour so that everyone can earn more, spend more, have more goods and a higher standard of living.

MICRO MATIC

MICROMATIC

MAKERS OF



Micromatic Model 705 Multiple Spindle Vertical Hydrohoner Machine with built-in automatic Microsize Control. For internal honing. Rotary indexing work table provides high production. Usually recommended for maximum stock removal ranging from .0005" to .0015" on hardened parts—.001" to .010" on soft or medium hard. Bores from ¼" to 2" diameter. Microsize control gauges work automatically. Work is held uniformly within tolerance of .0003". Honing cycle is automatically stopped when correct size is reached.

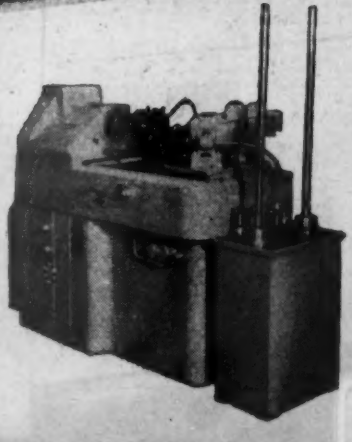
Micromatic Horizontal Floor Type Hydrohoner for internal or external honing. Tool operates either under hydraulic or manual control. Tools available to generate either crosshatch or co-directional finish patterns. Full floating tool action. Stock removal .0015" to .002"—precision generated size limits .0003". Corrects error for taper to within .0001" limit. Size of work accommodated 1" up.

THESE MACHINES NOW ON WAR WORK

Will Add to SPENDING POWER WHEN PEACE COMES

By Producing MORE GOODS at LOWER COST

Micromatic Model 702 Vertical Hydrohoner Machine. Standard single spindle type—built for rapid production honing of bores or cylindrical surfaces up to 2" in diameter.



Micromatic Ball Stud Honer—generates precision sphericity without measurable error on ball studs. Removes .030" stock on diameter from turned heat treated forging.

Micromatic Horizontal Honer working on production honing of silver plated bearings. On this non-ferrous honing job the Micromatic Machine reduced costs 50% from previous methods.

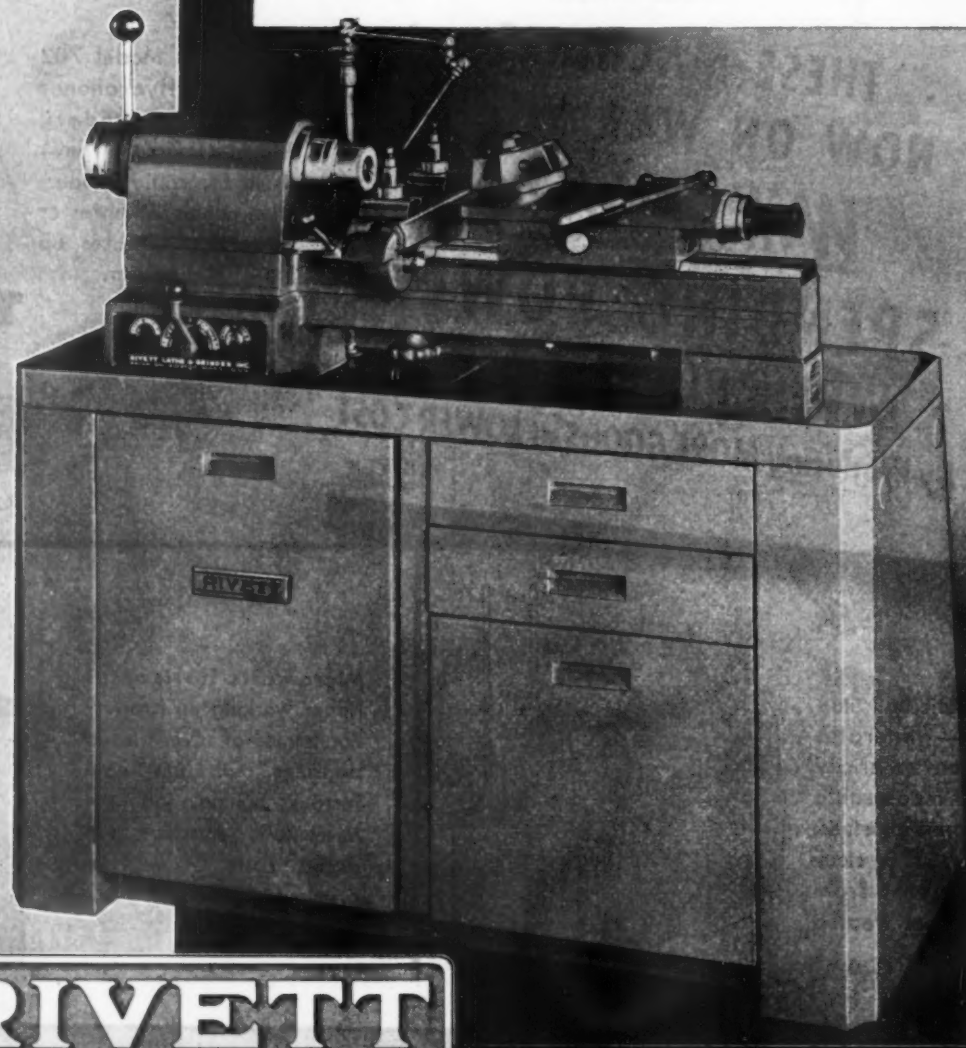
HONE CORPORATION DETROIT 4, MICHIGAN

HONING MACHINE TOOLS

PRODUCTION WITH PRECISION ASSURES PROFITS

The Rivett 918 Hand Screw Machine can produce in volume and maintain finish and size to the most exacting specifications. These characteristics have brought ideas into mass production that were once confined to the toolroom. Consider the Rivett 918 for finishing rough blanks or for producing from bar stock.

Write for Bulletin



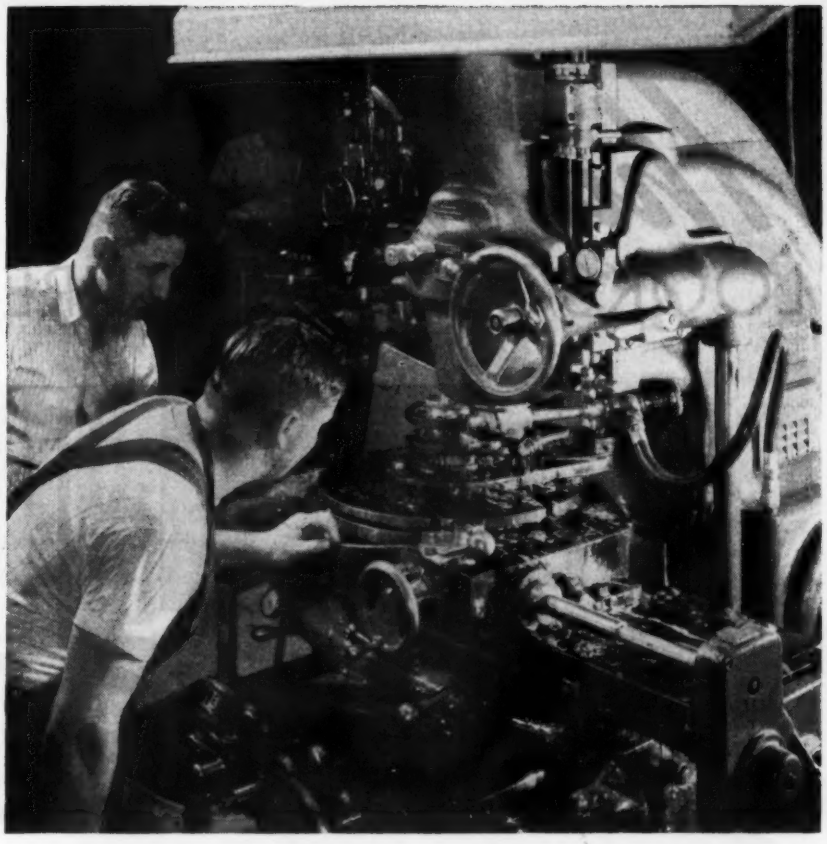
RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

"With Gulf Lasupar Cutting Oil we increased production 11%, tool life 90%"

says this Foreman



"WHEN WE SWITCHED to Gulf Lasupar Cutting Oil for milling aircraft connecting rods, we secured an immediate boost in production and tool life," says this Foreman. "With this quality cutting oil, production is up 11%, and tool life over 90%."

Here is a cutting oil that may be the answer to your tough, hard-to-speed-up machining operations—and to your requirements for an exceptionally fine finish on the work. Gulf Lasupar Cutting Oil has set new standards of performance for tough jobs in hundreds of aircraft, armament, and munitions plants.

And war production reports on Gulf Lasupar have a peacetime value: This cutting oil can help shops seeking lower unit production costs and finer finishes for postwar business!

Gulf Lasupar Cutting Oil—and the other quality cutting oils in Gulf's complete line—are available to you through 1200 warehouses located in 30 states from Maine to New Mexico. Write, wire, or phone your nearest Gulf office.

GULF OIL CORPORATION · GULF REFINING COMPANY

Division Sales Offices:
Boston · New York · Philadelphia · Pittsburgh · Atlanta
New Orleans · Houston · Louisville · Toledo

GULF INDUSTRIAL LUBRICATION

Gulf Quality Cutting Oils

Gulf Lasupar Cutting Oils A, B, and C
Gulf Electro Cutting Oils A, B, and C
Gulf M-L Cutting Oils A, B, and C
Gulf Cut-Aid
Gulf Cutex B
Gulf L. S. Cutting Base A and B

Gulf Oil Corporation · Gulf Refining Company AM
3800 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of the booklet, "Gulf Cutting Oils," which includes a helpful Machining Guide.

Name.....

Company.....

Title.....

Address.....

This Machine LOOKS TO THE FUTURE

Illustration shows standard *American* V-1½-4 ton Vertical Hydraulic Press tooled for broaching four wrench slots simultaneously in a time fuse. The slide on which the fixture is mounted is interlocked with the machine controls. Rate of production is 200 parts per hour with fine finish. This is just one example of the many types of jobs performed by this versatile machine.

THIS standard *American* V-1½-4 ton Vertical Hydraulic Press greatly simplifies reconversion and makes possible worthwhile savings in equipment and re-tooling costs. It is capable of performing a large variety of work and is easily and economically changed over from one job to the next.

American engineers have developed several such versatile standard machines. One or more will undoubtedly fit into your present or future operations. When planning new production, be sure you get *American's* recommendation. There is no obligation. It is part of *American's* complete broaching service—machines, tools, and engineering. Write today for details.

To prevent misalignment and tool damage, use proper fitting pull heads with your broaching tools.

MEMBER BROACHING TOOL INSTITUTE

American BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO.

Continued

Grinding Questions Answered

By Allen Steele, Manager, Dayton Grinding Wheel Division
SIMONDS WORDEN WHITE COMPANY

This series of questions and answers is presented as a practical aid in the solution of many of the more common grinding problems. Readers are invited to send in their own grinding questions, without obligation of any sort. All questions will be answered by mail or in this column. No identities will be revealed if published.

37 Q. *"Due to taking on many new and inexperienced grinding machine operators, we have had a lot of trouble with the diamonds burning or breaking in our dressing tools. What are the rules to prevent this so that we can have them printed and hung up as a reminder?"*

A. The principal rules for preventing the diamonds in dressing tools from burning, breaking or becoming loose in their mountings are: (1) Use a generous amount of grinding compound when dressing a wheel; (2) take frequent pauses in the operation to allow the stone to cool; (3) do not exceed .001" infeed per pass; (4) start the pass gently to avoid shock—as even a moderate shock will often break a diamond; (5) don't "run" the stone across the wheel, but use a "dragging" motion; (6) if dressing or truing the periphery of a straight wheel, cant it so that the axis of the tool is at an angle of from 3 degrees to 15 degrees with the radius (it is permissible to set the tool as much as 1/4" below the radius of the wheel, but never above it); (7) if the wheel has become slightly tapered or convexed, bring the stone into contact with it at its highest point. (One exception to the foregoing rule is dressing for a high finish. In such case, it is best to set the diamond "not quite" in contact with the wheel and then feed-in .001" with each pass until contact is made. The purpose of this method is to avoid leaving "diamond marks" on the wheel.)

38 Q. *"We have just started a centerless job on soft steel rods approximately one inch in diameter. We are having some trouble with scoring or 'picking up' action between the blade and the work. The blade is high speed steel. Would a blade of different material be likely to overcome this trouble?"*

A. When the pieces being ground are of soft steel, "Meehanite" or ordinary cast iron, blades are most frequently used as they eliminate the scoring or "picking up" action of which you complain.

39 Q. *"Is there any simple method whereby minor vibrations can be detected in a mechanical dresser or diamond holder?"*

A. The most simple method we know of for detecting minor vibrations in a mechanical dresser or diamond holder is to place the bit of a screw driver solidly against the suspected seat of the trouble. This will pick up and amplify such vibrations at the end of the screw driver handle.

40 Q. *"In wet grinding, does it make any difference whether the coolant falls above or exactly at the point of contact between the wheel and the work?"*

A. It makes no difference in grinding results whether the coolant falls above or at the point of contact between the wheel and the work. However, there is less splashing if it falls a little above the point of contact.

41 Q. *"In centerless grinding what factor determines the length of blade to be used?"*

A. The length of the blade is determined by the width of the wheels. As for the thickness of the blade, it should be slightly less than the diameter of the work being ground.

42 Q. *"We are rough grinding soft steel bars 8" long by 1 1/4" square. Through use of a special magnetized 'spider' in which the bars are placed and held, the job is being done on a Hanchett rotary table type surface grinder. What do you recommend in the way of segmental wheels to remove .010" to .035"?"*

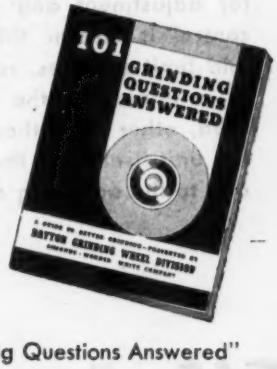
A. From your explanation of the job, we recommend Dayton segmental wheels 8A-46 K-15-V-55 (old marking 846 K-1-L). We hope we may have the privilege of working with you on this job.

43 Q. *"On a new job we are starting there is a dry cut-off operation which tends to produce a discolored surface due to excessive heat, and this affects a later machining operation. What do you suggest to eliminate this trouble?"*

A. We suggest that you use a wheel of finer grain and softer grade. Such a change should eliminate the trouble you complain of, but, of course, it will also lower your production rate somewhat.

READY NOW...a guide to better grinding!

101 "Answers" to everyday grinding problems—indexed for quick, easy reference—will be sent FREE to anyone interested in better grinding practices. Just fill in and mail coupon below.
SIMONDS WORDEN WHITE CO., DAYTON 7, OHIO.



DAYTON GRINDING WHEELS

SIMONDS WORDEN WHITE CO.,
712 Negley Place, Dayton 7, Ohio

Please send me Free Booklet "101 Grinding Questions Answered"

Name_____

Firm_____

Address_____

City_____ Zone_____ State_____

COPYRIGHT 1945, SIMONDS WORDEN WHITE CO.

Hy-Mac (HYDRAULICS) APPLIED TO ANY ....ALL.... OR COMBINATION OF MOVEMENTS

12777—Special power unit for controlling and actuating a special contour type milling machine with multiple slides. This design permits the assembly of the completed unit on the base of the machine and provides easy accessibility for adjustment and maintenance. The control is electric through push-button and limit switches, reducing the piping to a minimum, the only pipes being used, other than those incorporated in the unit itself, are those connecting the unit to the actuating cylinders.

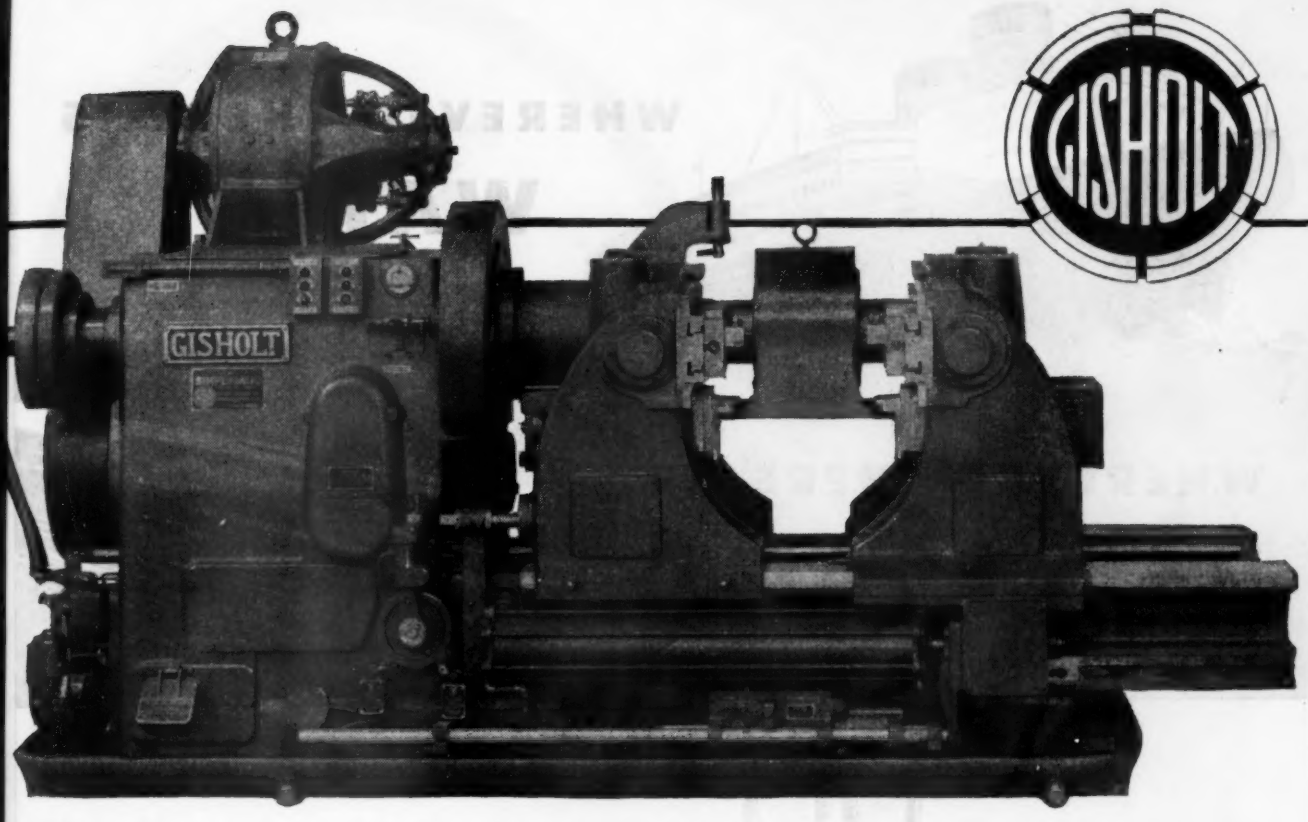
"Hy-Mac" Hydraulic Power Units can be applied to milling, drilling, grinding, boring, piercing, riveting, broaching, pressing . . . just determine the functions of the machines that are to be hydraulically operated—and our engineers will recommend a Power Unit and a layout of circuits to best do the job . . . For feed and traverse of multiple or single tools . . . for indexing and locating . . . for clamping, etc. . . . any . . . all . . . or combination of movements can be adapted to "Hy-Mac" HYDRAULICS . . . Designers or builders of machines can accommodate their specific design, either partially or completely to "HY-MAC" HYDRAULICS . . . and our modern plant, together with a comprehensive engineering department is completely competent to handle all of the technical planning, designing, and detailing in connection with building of hydraulic and specific-purpose machinery . . . Our engineers will make recommendation and preliminary proposal without obligation.

HYDRAULIC MACHINERY INC.

12825 FORD ROAD — DEARBORN, MICHIGAN

HYDRAULIC MACHINERY—WESTERN DIVISION • 1105 N. Pacific Ave., Glendale 2, Calif.

HYDRAULIC MACHINERY



GISHOLT

Motor frames machined – both ends – three minutes – ORLESS

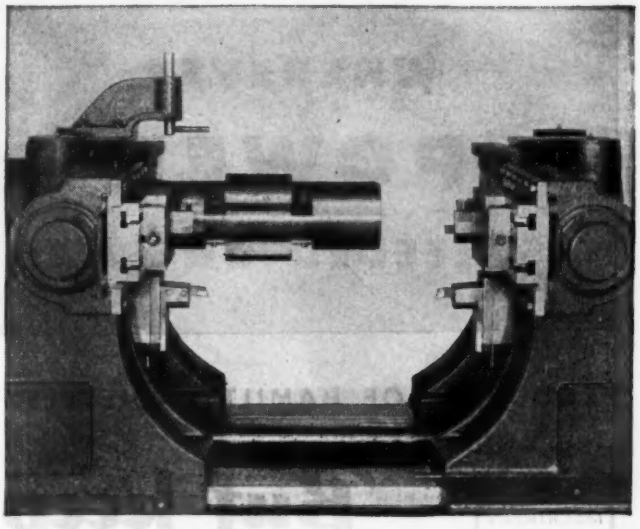
Here's another example of the way this versatile automatic lathe can be adapted to handle an extremely wide range of work.

THE GISHOLT SIMPLIMATIC

Equipped with two special vertical carriages, this Gisholt Simplimatic is set up to machine both ends of these motor frames at once.

Finish facing and boring operations are made possible at both ends simultaneously by the flexible arrangement of front and rear slides. Work is carried on an expanding arbor with pilot. Allowing two minutes for loading and unloading, the longest floor to floor time on any of three different sizes of frames is three minutes. Actual machining time is one minute or less.

If you produce standard parts in sufficient volume to consider the economy of automatic machining, look into the Gisholt Simplimatic. It is available in both Platen and Radial types. Write for full information.

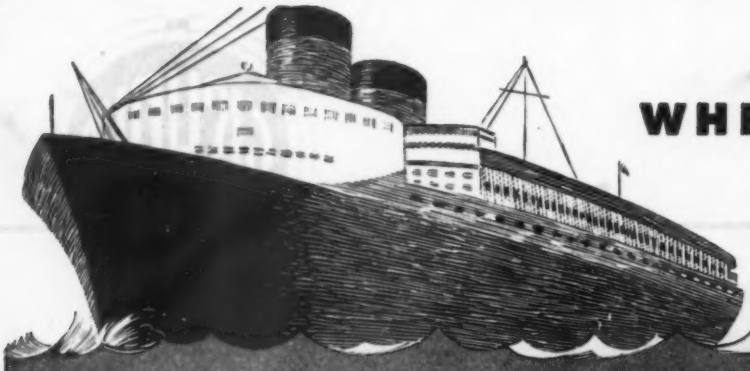


This tool arrangement permits still another pair of slides to be mounted at the rear of the vertical carriages. Front slides can then be used for rough facing and rough boring with a shaving cut, rear slides for finish facing, and lower slides (feeding longitudinally) for finish boring.

GISHOLT MACHINE COMPANY
1201 East Washington Ave. • *Madison 3, Wisconsin*

Look Ahead . . . Keep Ahead . . .
With Gisholt Improvements in Metal Turning

URRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

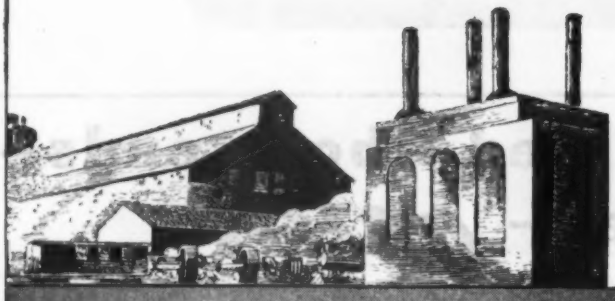


WHEREVER THERE IS

WATER

WHEREVER THERE ARE

RAILROADS



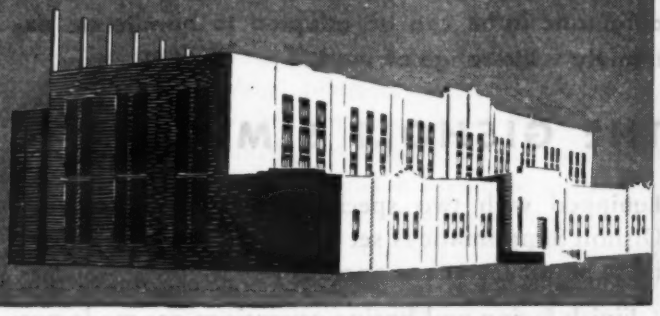
WHEREVER THERE IS

MANUFACTURING

WHEREVER

POWER

IS NEEDED ON LAND



PRODUCERS OF HAMILTON-DIESELS, STEAM ENGINES AND MACHINE TOOLS

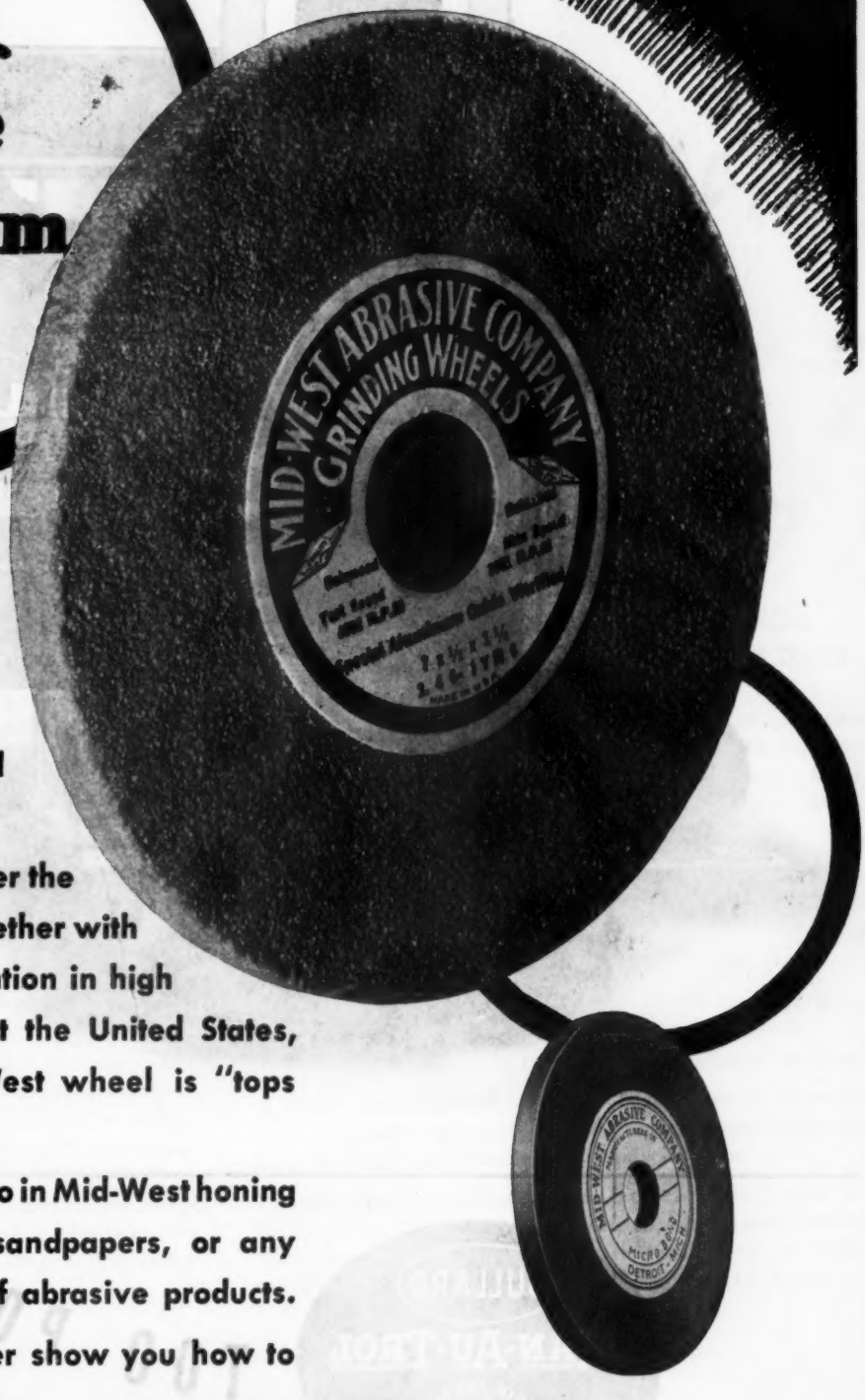
But keep that guard up!

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO. • THE HOOVEN, OWENS, RENTSCHLER CO. • GENERAL MACHINERY ORDANCE CORPORATION

"Tops" for the Tool Room



The new tool room grinding wheel of the Mid-West Abrasive Company clearly shows its superiority in high speed tool steel operations.

Test after test, conducted under the most rigorous conditions, together with many months of actual operation in high production plants throughout the United States, demonstrate that the Mid-West wheel is "tops for the tool room."

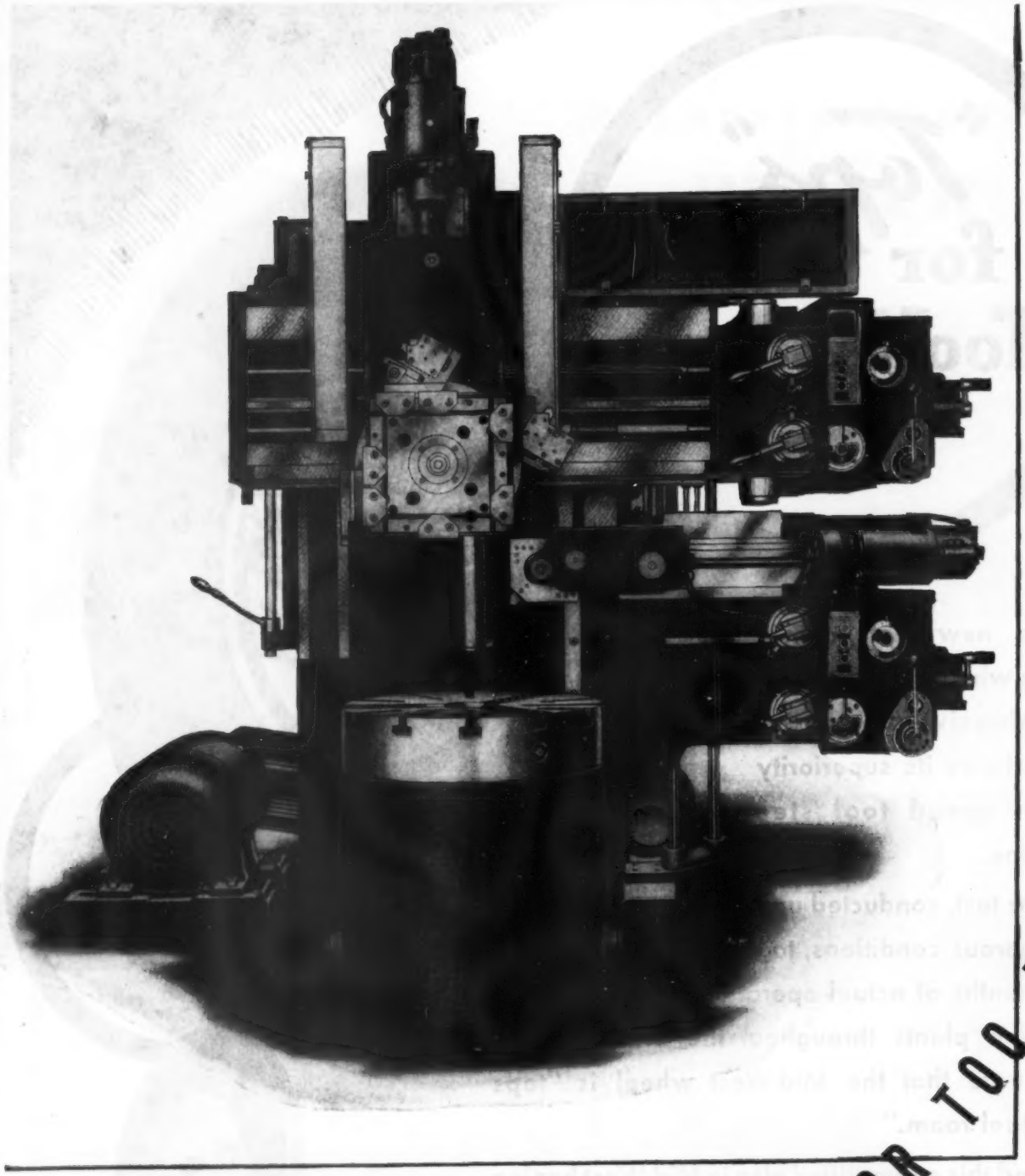
You'll find this exemplified also in Mid-West honing stones, sharpening stones, sandpapers, or any of Mid-West's broad range of abrasive products.

Let a Mid-West field engineer show you how to solve your abrasive problem.

MID-WEST ABRASIVE CO.

Manufactures of DEPENDABLE Abrasives

Owosso, Mich. • Detroit • Rochester, Pa.

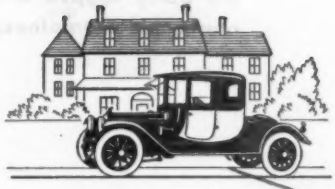


BULLARD

MAN-AU-TROL

MASTER OF THE MACHINE

TOO POOR OR TOO RICH



IS USUALLY A MATTER OF PRICE

Only the rich rode in automobiles in 1910

Even the poor were riding in 1940

Yet most of the poor were no "richer"

Permitting more people to enjoy what Industry has created is the essence of America's high standard of living. It has come about *partly* because their wages have been increased . . . *mostly* because prices have been reduced to meet their wage levels.

You can easily verify that. Records show that, during the years of the greatest advance in American living standards, the cost of goods *decreased* by a greater percentage then wages *increased*. That more people had more things to enjoy was less a matter of having more money to spend than of goods costing less to buy.

And how were the costs of goods lowered?

By more efficient manufacturing methods . . . by the same means that can be employed by Industry . . . by you . . . as America comes out of this war.

Making machines do more is the essence of efficient production. That is why Industry is welcoming the Bullard Man-Au-Trol principle of Automaticity as enthusiastically *today* as manufacturers in the past have greeted every other outstanding Bullard manufacturing method. Man-Au-Trol, for the first time in machine tool history, makes an automatic machine as flexible as a multi-purpose, manually-operated machine. With it, Industry can take great price-lowering strides toward making the poor richer . . . and markets more secure.

HOW THE BULLARD MAN-AU-TROL VERTICAL TURRET LATHE LOWERS UNIT PRODUCTION COSTS

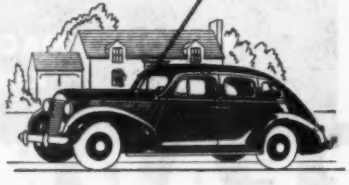
1. LIGHTENS LABOR'S LOAD: The operator goes once through the machining cycle manually, setting the best production method into an automatic cycle. Then he merely loads, supervises and unloads while the Man-Au-Trol does the work.

2. MAKES AUTOMATICITY VERSATILE: It automatically machines any and all work which the Vertical Turret Lathe can handle when operated manually. Is instantly convertible for manual operation on the same piece or an entirely different piece without affecting the automatic cycle for which it is set.

3. SAVES SET-UP TIME: Unlike so many other automatic machines, its set-up time from one class of work to another is only slightly more than a manually-operated machine.

4. REDUCES SALVAGE COSTS: It machines day after day with a degree of accuracy impossible under manual operation because it eliminates human and cumulative error.

For additional facts about the way the new Bullard Man-Au-Trol Vertical Turret Lathes minimize tool investment, reduce machining time and other manufacturing costs, write for Bulletin A—today. The Bullard Company, Bridgeport 2, Conn.

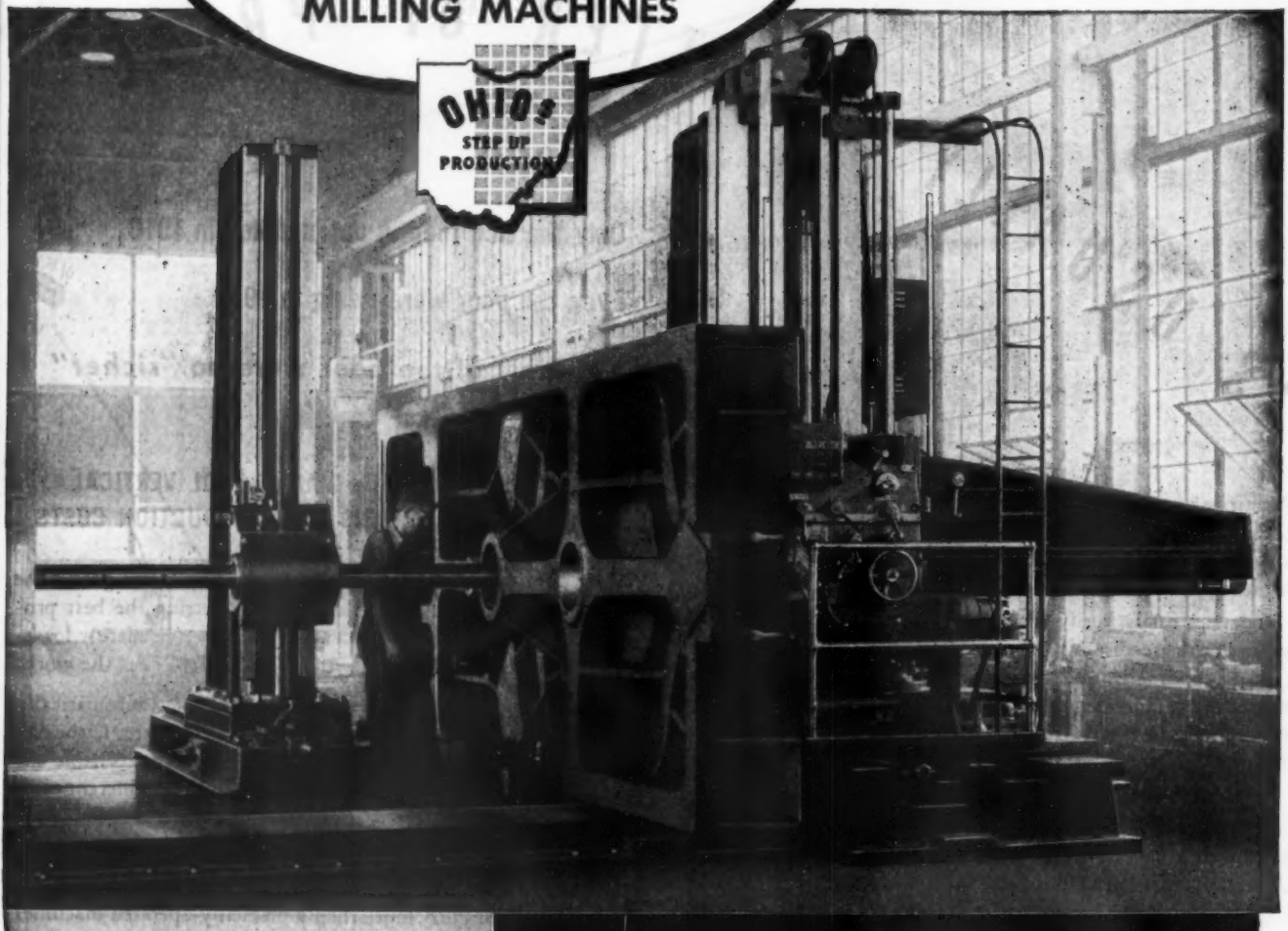


BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

ORDERS
for Ohio Horizontals are being shipped with reasonable promptness.

OHIO HORIZONTAL

BORING, DRILLING AND MILLING MACHINES



Boring, drilling, and milling operations on a 22000-pound cast steel power shovel base were handled accurately on a 6 FA Ohio Horizontal.

This country is in a big hurry. Production must mount — WITH ACCURACY. Quantity of work *with quality*, if you please. Ohio Horizontals are built for power and precision, together with safety and easy handling. Their many features today are in keeping with a record of performance which goes back to 1930, when America's first all-anti-friction boring, drilling, and milling machine appeared, bearing the name of Ohio. . . . *Get Bulletin 1000.*

THE OHIO MACHINE TOOL COMPANY
KENTON, OHIO

OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

UNION
Union Twist Drill Co.
Athol, Mass.
UNION ★ BUTTERFIELD ★ CARD Divisions of the Union Twist Drill Company

REAMERS by Butterfield

Illustrated: Straight and Spiral Fluted Hand Reamers, Straight and Spiral Fluted Chucking Reamers, Straight and Spiral Fluted Expansion Reamers, Lok-Tite Expansion Chucking Reamers.

Butterfield assures you of dependable efficiency and the most rigid standards of accuracy — your guarantee of high-quality, trouble-free performances in heavy duty reaming operations.

Butterfield Division

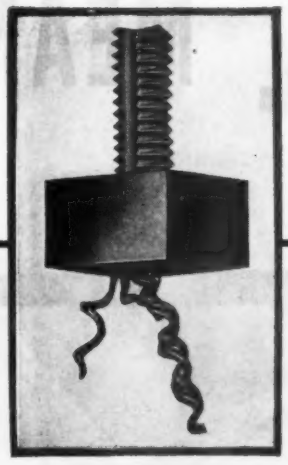
Derby Line, Vt. **Rock Island, Que.**

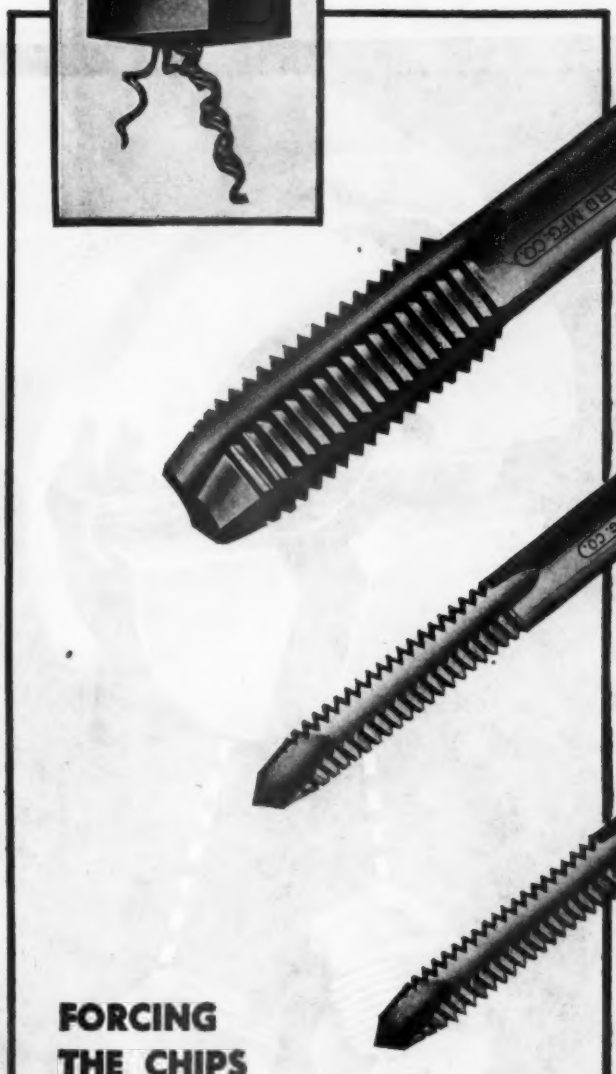
STORES: New York, 61 Reade St.—Chicago, 11 So. Clinton St.—Cleveland, Hal. W. Reynolds, 3346 Superior Ave.—Detroit, 5527 Woodward Ave.—Los Angeles, 524 E. Fourth St.—Toronto, 137 Wellington St., West—Montreal, 111 St. Paul St., West—David Philip Agencies, Limited, 212 Bannatyne Ave., Winnipeg, Man.—Vancouver, 327 Shelly Bldg. Agents for Great Britain: Charles Churchill & Co., Ltd., 27-34 Walnut Tree Walk, Kennington, London, S.E. 11, England. Branches at Birmingham, Manchester, Glasgow, Newcastle-on-Tyne and Bristol.

UNION ★ BUTTERFIELD ★ CARD

CARD

HAND TAPS





FORCING THE CHIPS *ahead* OF THE TAP . . .

Above is a detailed view of chip-action produced by Card Spiral Pointed Hand Taps. Long, curling chips are forced ahead of the Tap – avoiding clogging – increasing strength of Tap – reducing breakage.

S. W. CARD MFG. CO.
Mansfield, Mass.

Divisions of the Union Twist Drill Company

VERS-O-TOOL MEANS S

The first big advantage of the Vers-o-tool is its versatility. With ground thread chasers you can cut precision threads. Or into the *same head*, you can insert circular cutting tools and blocks, for end turning, end forming, recessing, knurling, burnishing or combination cutters for threading and turning at the same time.

The next big advantage is the saving in tool investment that comes with

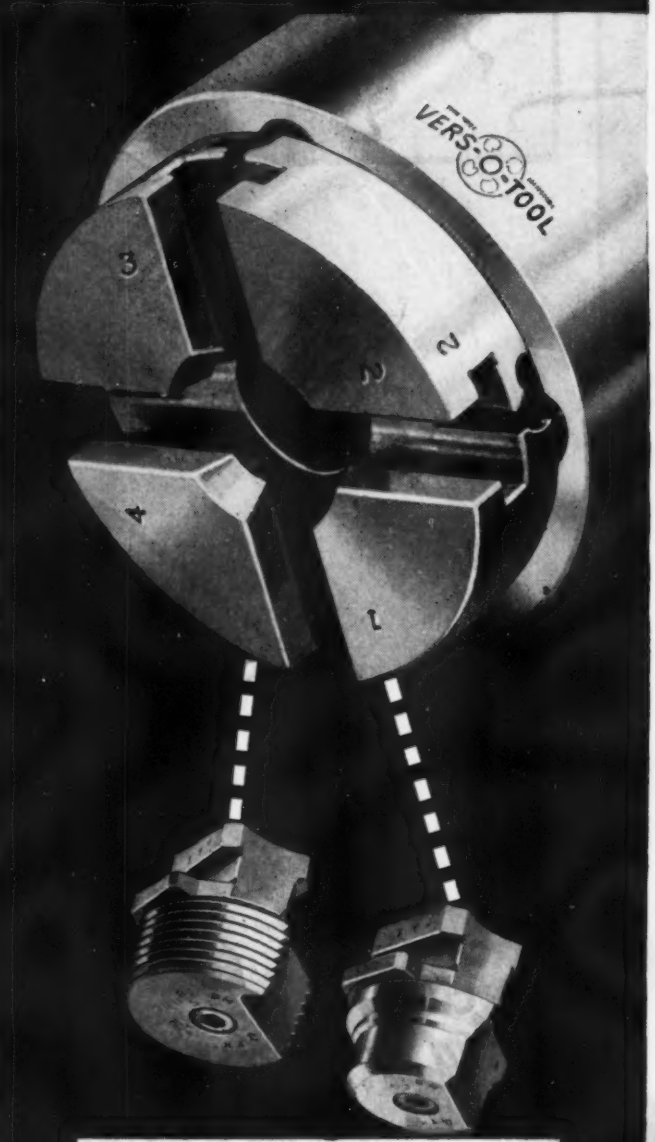
VERS-O-TOOL

this versatility—almost a countless variety of operations can be done with a single self-opening head.

You have all of the proved facilities of National Acme methods for speed of operation, precision and low cost of production.

Vers-o-tools bring you important help in producing the improved precision products of the coming years—at new *low costs*.

Catalog D-42-B gives full details.



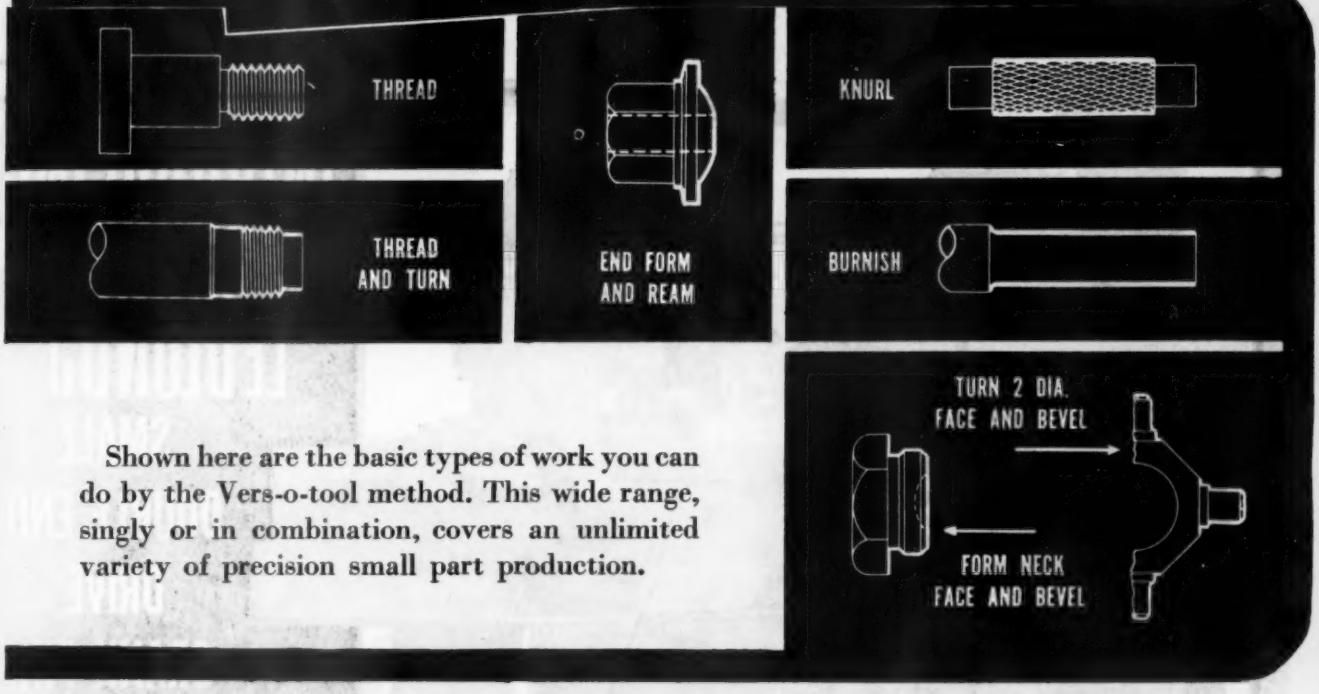
HERE IS ALL YOU NEED

With the Vers-o-tool Head, and circular chasers or circular cutters mounted on blocks, you can insert reground tools in one minute without disturbing the setup, and without change of precision. No "trying for size" needed—the first piece is *production*.

Ground Thread Circular Chasers and Circular Cutters last longer—they can be reground through 270° circumference.

NS SPEED • PRECISION • LOW COST

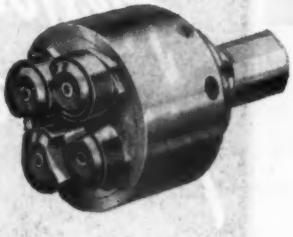
on jobs like these



Shown here are the basic types of work you can do by the Vers-o-tool method. This wide range, singly or in combination, covers an unlimited variety of precision small part production.

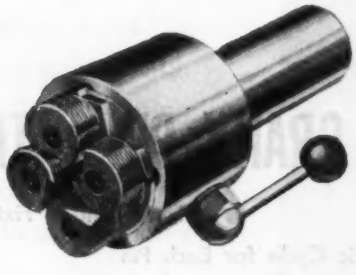
ALL DR, DS and DBS NAMCO MULTIPLE CIRCULAR CUTTER/CHASER HEADS ARE

VERS-O-TOOLS



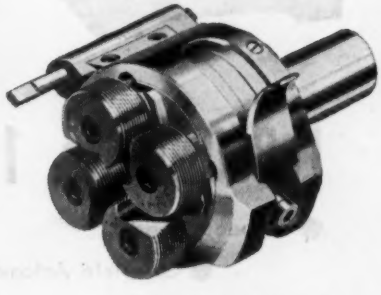
DR CIRCULAR REVOLVING TYPE HEAD

Capacity .056" to 5". Self-opening. For circular chasers and circular cutters.



DS CIRCULAR STATIONARY TYPE HEAD

Capacity 3/16" to 5". For circular chasers and cutters. Opens and closes manually or automatically.



DBS CIRCULAR STATIONARY TYPE HEAD

Capacity .056" to 9/16". Especially made for Browne & Sharpe Automatic Screw Machines.

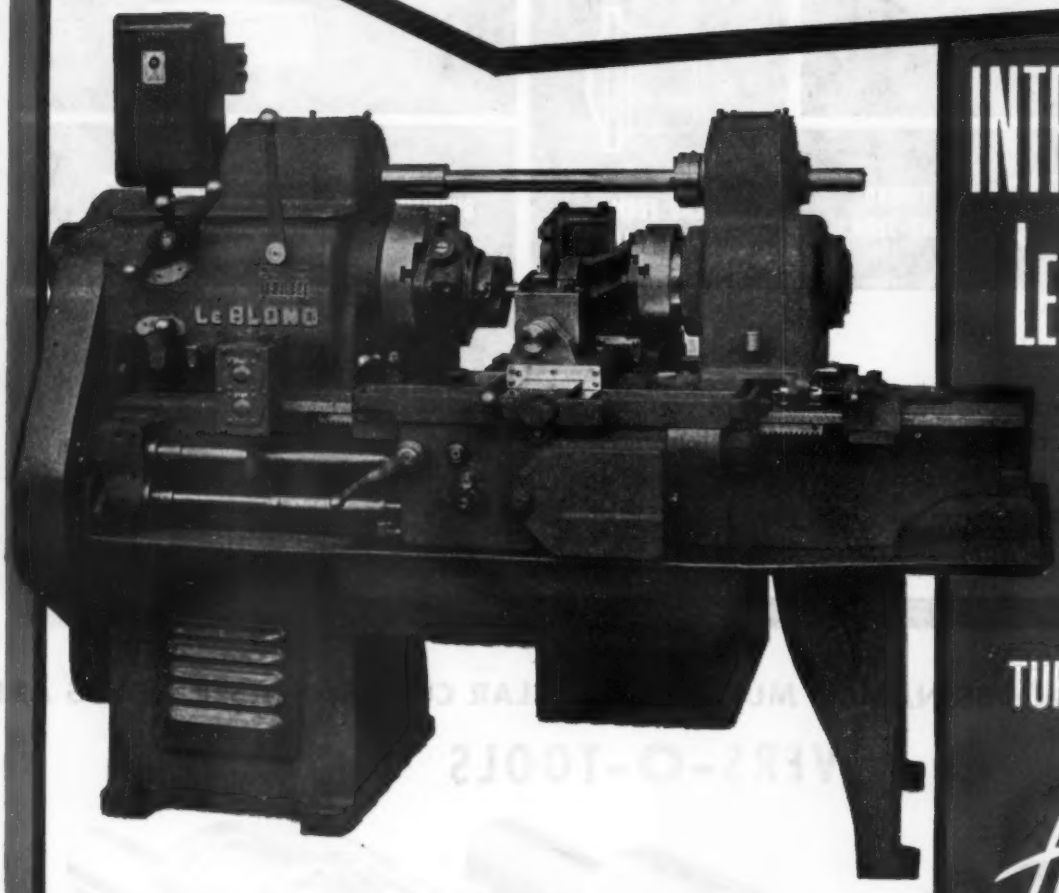
The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme • Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

HERE IS THE SOLUTION TO YOUR

SMALL CRANKSHAFT PRODUCTION PROBLEM



INTRODUCING LeBLOND'S SMALL DOUBLE END DRIVE CRANK PIN TURNING LATHE

flexible-productive

LeBLOND No. 1 CRANK PIN LATHE

- 6-Speed Head
- Universal Index Fixtures
- Complete Automatic Cycle for Each Pin

Send us your prints and production requirements.

ARMY E NAVY

★ YOUR BONDS BUY BOMBS ★
BUY A "BLOCK-BUSTER" TODAY!

THE R. K. **LeBLOND** MACHINE TOOL CO., CINCINNATI 8, OHIO, U. S. A.

NEW YORK 6, Singer Bldg., 149 Broadway, WOrth 2-0722
CHICAGO 6, 20 North Wacker Drive, STA 5561

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

For greater *accuracy, speed* and *economy* in *your* thread cutting

MODERN

STATIONARY TYPE SELF-OPENING

DIE HEADS

Modern Self-Opening Die Heads thread diameters from ½" to 7" in standard heads, and up to 14" in special heads . . . accurately, fast, and economically. They are adapted to practically every thread cutting operation within their capacity. Designed for use in hand screw machines, turret lathes, and other machines where the die heads are used in a stationary position.

PROMPT SHIPMENT....USUALLY FROM STOCK

- Wider threading range with greater flexibility. Unusually well suited to general purpose diversified threading work.
- Soundly designed and carefully built to insure maximum productiveness combined with long lasting, accurate service.
- Made with the least number of parts. Hardened and ground throughout. Wear is held to a minimum.
- Simplified design makes chaser change quick and easy. No special tools required.

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Then he said to himself

"No Joy—No Strength"

HIGH point in faith toward a losing technique was exhibited by "Herr Doktor" Ley . . .

—leader of Hitler's "Strength Through Joy" Youth Movement.

Sitting between two GI's who had frisked him of his cyanide vial, he unjoyfully maintained:

"Adolph Hitler was Germany's greatest man."

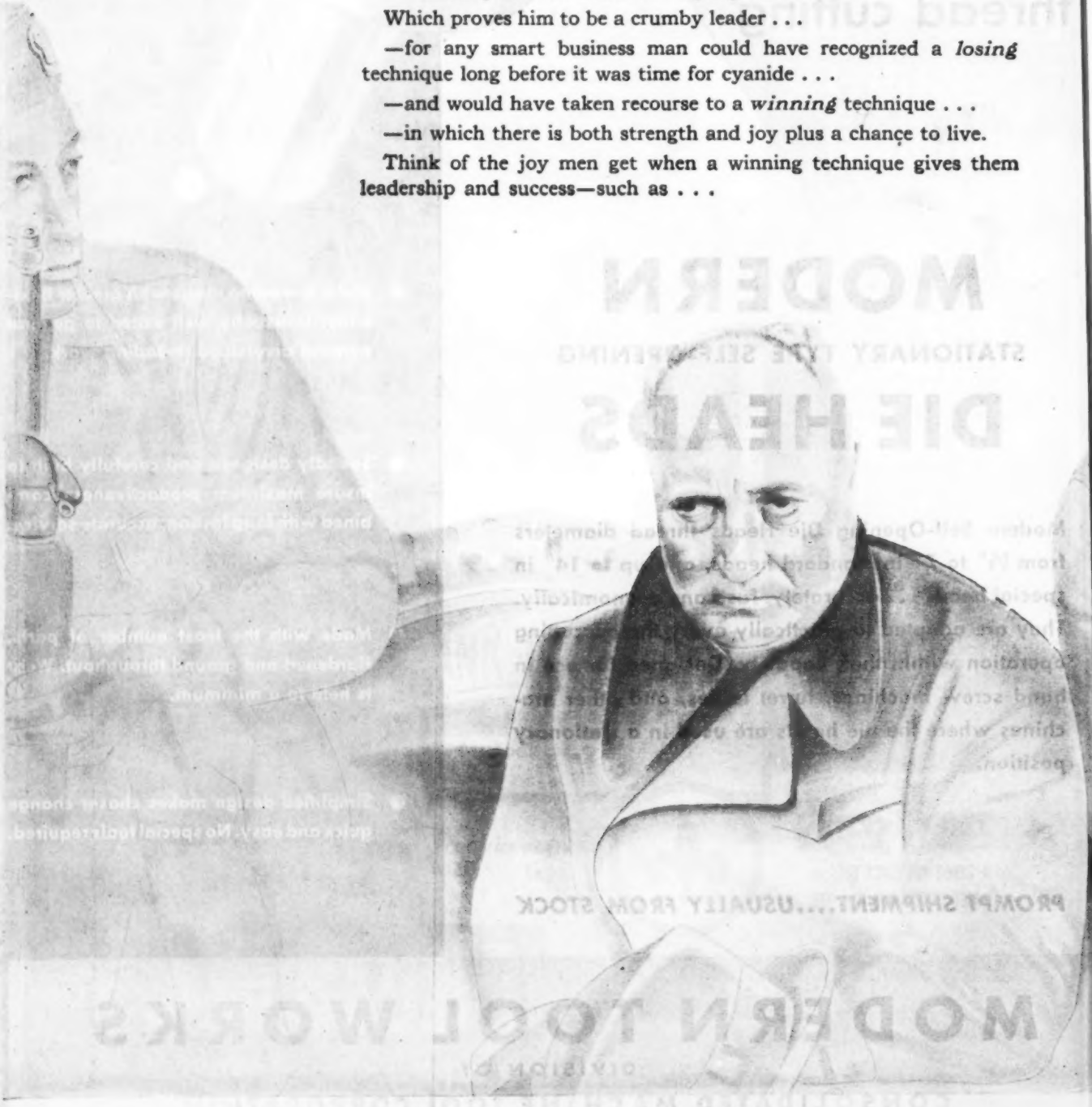
Which proves him to be a crumby leader . . .

—for any smart business man could have recognized a *losing* technique long before it was time for cyanide . . .

—and would have taken recourse to a *winning* technique . . .

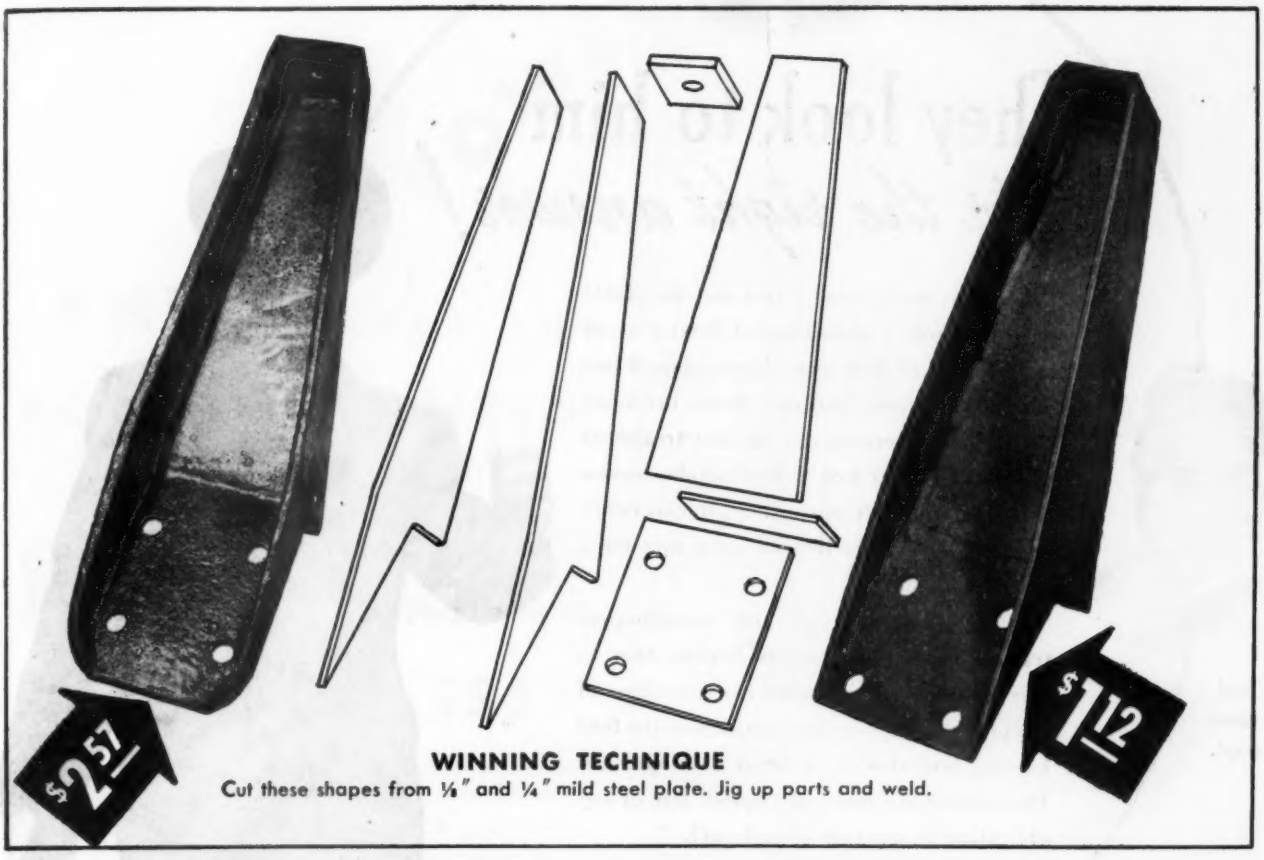
—in which there is both strength and joy plus a chance to live.

Think of the joy men get when a winning technique gives them leadership and success—such as . . .



LOOK, HERR DOKTOR, how to obtain

STRENGTH THROUGH WELDING



WINNING TECHNIQUE

Cut these shapes from ⅛" and ¼" mild steel plate. Jig up parts and weld.

COMPETITIVE STRENGTH . . . AND PHYSICAL STRENGTH

Lower costs and improved products are obtainable through welded design. Of conventional construction, this truck cab support cost $2.57 . . . weighed 18 lbs. Of welded steel, it costs only $1.12 . . . weighs 12 lbs. SAVES $1.45 EACH.

A unit of uniform, flawless construction and highest possible physical properties is obtainable with this "winning technique". This welded part, made from mild steel plate has the strength, rigidity and durability of mild steel *throughout*.

Lincoln Engineers will gladly help apply this winning technique to the solution of your problems of design and production. Machine Design Studies free on request. Ask for them on your business letterhead.

THE LINCOLN ELECTRIC COMPANY • Dept. I-1, Cleveland 1, Ohio

America's greatest natural **recourse**

ARC WELDING

General Manager

They look to him

...for the right answer!

Production men in many tool and die plants regard Latrobe's Metallurgical Service as an integral part of their own organization. When unusual problems confront them, involving the selection, performance or heat-treatment of tool steels, they look to the Latrobe Service Man for the right answer. Past experience has taught them to depend upon him for a speedy solution.

Practical knowledge and metallurgical training enables the Latrobe Service Man to give thorough consideration to every phase of the problem, his constant contacts in the field keeping him abreast of latest developments. His services are yours on request, free of any obligation to any user of tool steel.

Tool Room Supt.

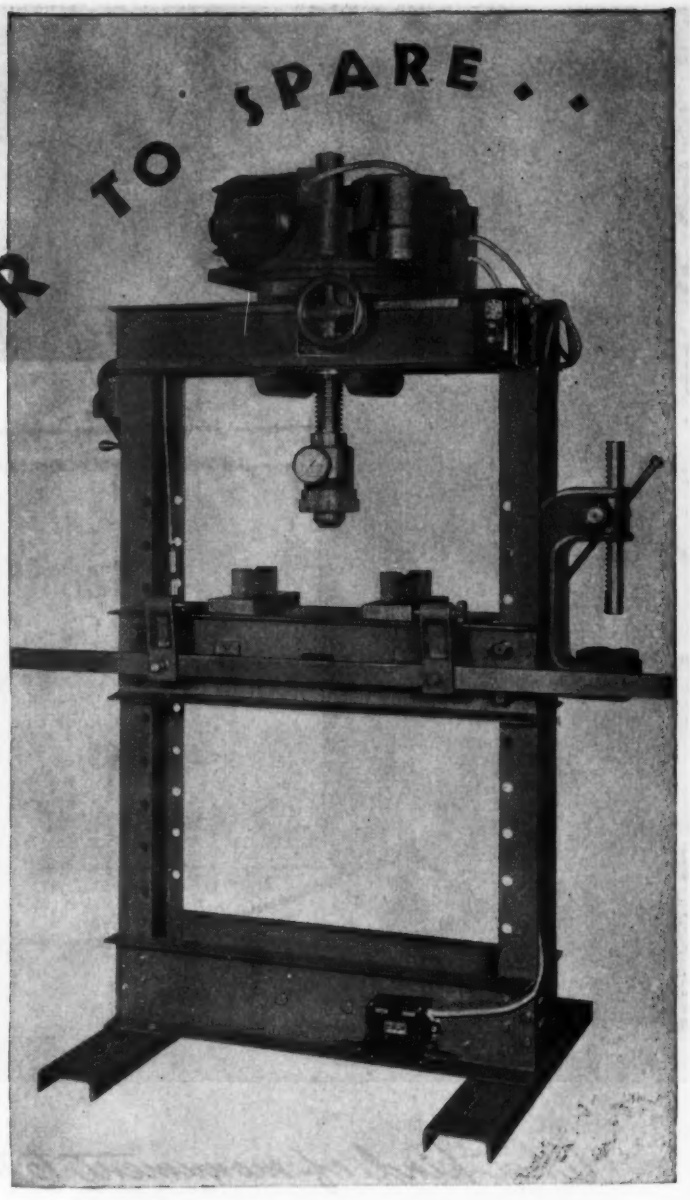
Heat-Treat Foreman

LATROBE *Metallurgical Service*

HIGH SPEED STEELS · DIE STEELS · TOOL STEELS · STAINLESS · LATROBE RED ARROW for metal-cutting tools

S-3

LATROBE ELECTRIC STEEL COMPANY · LATROBE, PENNSYLVANIA



. . FOR THE

POWER YOU NEED

IN

PRESSUREMATIC

POWER PRESSES

They've got what it takes to do your assembling, press-fitting, disassembling, straightening, and bending jobs fast, accurately, easily! On the production line, in maintenance shops—or for die try-outs—Lempco presses operate rapidly and efficiently!

AUTOMATIC PRESSURE CONTROL

Ram may be reversed or stopped automatically at any pre-set pressure. Prevents spoilage. Enables inexperienced operators to produce skilled work.

- ★ *20 • 40 • 60 TON CAPACITIES*
- ★ *ELECTRIC & HYDRAULIC MODELS*
- ★ *0 TO 60 TONS IN 4 SECONDS!*
- ★ *$215 TO $1398*
- ★ *GOOD DELIVERY!*

WRITE FOR SPECIFICATIONS

LEMPCO

5711 DUNHAM ROAD • BEDFORD, OHIO

What kind of monument to the Unknown Soldier's son?

Here stands one of the most hallowed monuments in the world . . . and one of the most tragic.

For this American soldier died that the world might be safe for his son.

And his son was killed.

We propose a different kind of monument to this second generation unknown.

America now is more powerful than all the rest of the world.

More powerful in thought . . . A single American magazine today, printed in 11 languages, outsells any other publication in 53 countries of the world. People are eager for American ideas.

More powerful in armament . . . We have twice the air-power, and from two to four times the naval strength of the rest of the world totaled together. People respect American might.

More powerful in wealth . . . Over half the earth's total capacity to produce is here in our plants, machinery and skills. People need the things that America can produce.

This stupendous power can break down the barriers of ignorance, intolerance and want. It can *enforce* decency and peace upon the world. Ours is the chance and the responsibility to set an example for all the peoples of the earth to see.

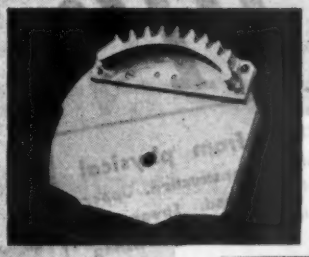
This would be a monument.

The engineers of the basic machine tool producers can help the men of government and of industry to build that monument . . . to plan now the reconversion of our power to all-out production for a better world.

One of these engineers is a Bryant man. We urge you to call him in today.

COMPANY SPRINGFIELD VERMONT, U.S.A.

Can you Complete this Shave Punch Milling Job in 60 hours?



Material Courtesy National Cash Register Company

The milling operation on this shave punch is an excellent example of the speed, economy, and accuracy obtained in a single setup with a Milwaukee 2D Rotary Head Milling Machine. Read the job report:

Shave Punch
Material — High Carbon, High Chrome Steel.
Cutting Speed — 30 fpm.
Operation Data — Mill contour as per drawing in one setup. Depth of contour 1-5/16"

Time Distribution — Setup and layout	6 hrs.
Rough mill contour to .005"	25 hrs.
Finish mill to .0005" / .0000"	29 hrs.
Total time	60 hrs.

Check these advantages of the Milwaukee Rotary Head Milling Machine and how you can benefit from them in your own shop:

DIRECT . . . mills intricate shapes in a single setup without the aid of templets or models — transmitting blueprint dimensions and outlines directly to the workpiece.

ACCURATE . . . chances for error are eliminated because there is no change in setup. Exact control of all combinations of cutting movements — possible only with this machine — transmits mathematical precision to the work.

FAST . . . initial job preparation and setup time are reduced to the minimum. Accurate performance of the machine saves operator's time and results in rapid production of work otherwise difficult to perform.

Write for Bulletin No. 1002C and complete information.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC JIG BORER • CENTER SCOPE.

Kearney & Trecker
Products
CORPORATION
Milwaukee 14, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Now UP TO 2000 hp!

STANDARD 2000-HP TRI CLAD MOTORS NOW AVAILABLE

THEY GIVE EXTRA PROTECTION 3 ways

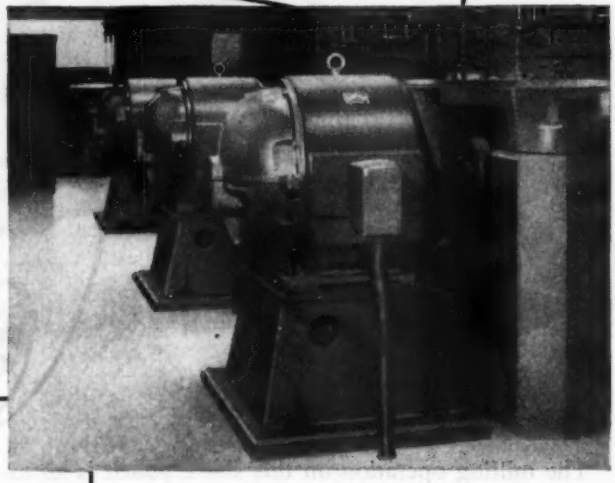
1 Extra protection from physical damage—Cast-iron construction. Upper portion completely enclosed. Streamline, cast-iron end shields. Corrosion-resisting finish.

2 Extra protection from electrical breakdown—Windings of Formex* wire, strongly bonded with oil- and moisture-resistant synthetic resins, stand up under abrasion or "heat-shock."

3 Extra protection from operating wear and tear—Sleeve or ball bearings, in dust-tight housings. Sleeve-bearing design is a further refinement of well-proved Tri-Clad bearing proportions, with cast-in "air seal" to further insure oil tightness of the housing.

The triple-protected construction that has made General Electric's Tri-Clad motor so popular in the small and intermediate sizes has now been extended to motors of 2000-hp capacity. On your *big* drives, these new Tri-Clad motors will meet severe conditions with greater assurance than ever of dependable service and long life.

The Tri-Clad motor, in its wide range of types and sizes, is industry's most popular integral-hp motor. Chances are there's a standard Tri-Clad to meet your requirements "on the nose." For information on G.E.'s complete line of Tri-Clad motors, ask for Bulletin GEA-3580. *General Electric Company, Schenectady 5, N. Y.*



Three of the new, large Tri-Clad motors, each rated 200 hp, 1200 rpm, driving coal pulverizers in a Southern steam-electric plant

***Trade-mark reg. U.S. Pat. Off.**

HERE'S TODAY'S WIDER RANGE OF STANDARD SIZES	
TRI CLAD Type K	—1 hp to 2000 hp at 1800 rpm
TRI CLAD Type KG (High starting torque, low starting current)	—5 hp to 200 hp at 1800 rpm
TRI CLAD Type KR (High starting torque, high slip)	—Available to 100 hp in speeds required for high-slip, flywheel drive (punch press, etc.)

Buy all the BONDS you can—*and keep all you buy*

GENERAL ELECTRIC

"Put it on the Blanchard"

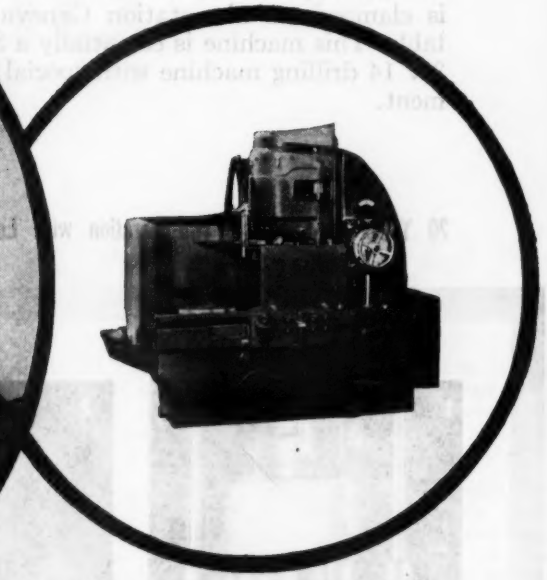
...GET THESE ADVANTAGES

Production ✓
Adaptability ✓
Fixture Saving ✓
Operation Saving
Material Saving
Fine Finish
Flatness
Close Limits

Grinding Pawl Arms

These are cast iron pawl arms with projecting bosses on one side at the ends of the arms. They are held on the 36" chuck of a No. 18 Blanchard Grinder with the projecting bosses extending down outside the chuck.

Twenty-one pieces are placed on the chuck at one time and two loads or forty-two pieces are ground per hour, removing 3/16" of metal.



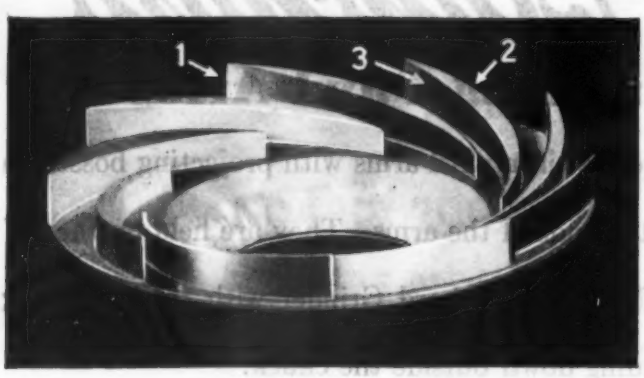
No. 18 BLANCHARD SURFACE GRINDER

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

THREE *Snyder* SPECIALS *for* MILLING DIFFUSER PART



One of the chief objectives in creating these three special milling machines was to reduce to a minimum the need for costly, time-consuming hand finishing operations on an aircraft diffuser part.

First operation uses a vertical, two-spindle, end-milling machine to mill a 1/32" radius on each end of the nine diffuser vanes. End mills are installed on eccentrically mounted quill housings which rotate through nearly 180°. Two-spindle head, motor and drive mechanism slide into position hydraulically, supported by two guide bars. Part is clamped on nine-station Geneva index table. This machine is essentially a Snyder 3 v 14 drilling machine with special equipment.

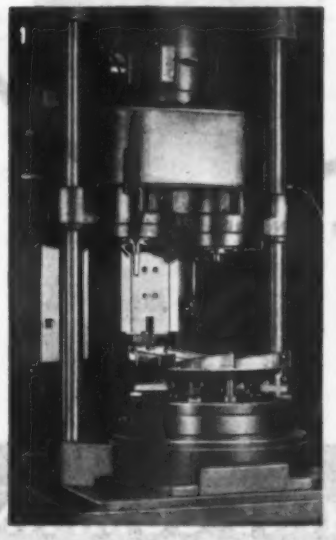
Second operation uses a vertical, single-spindle miller with side milling cutters set on an angle to the vertical center line. Besides feeding the cutter down, moving the entire slide in and out and rotating the table at feed rate, it also is necessary to keep the cutting edge of the milling cutters tangent to the various radii which make the contour of the vanes. Therefore it was necessary to rotate the spindle housing angularly in correspondence to the in-and-out movement of the main slide. This operation is completed in nine passes.

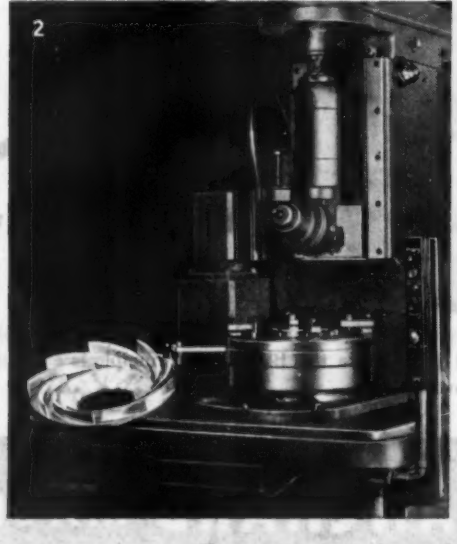
Third operation uses a vertical, single-spindle end mill in which the housing follows the contour of the part by cam action. Part is rotated at feed rate through an arc while the vertically feeding spindle housing is moved in and out through cam action. All three actions of the feed mechanism—feeding cutter up and down, moving in and out and rotating the part—are mechanically synchronized.

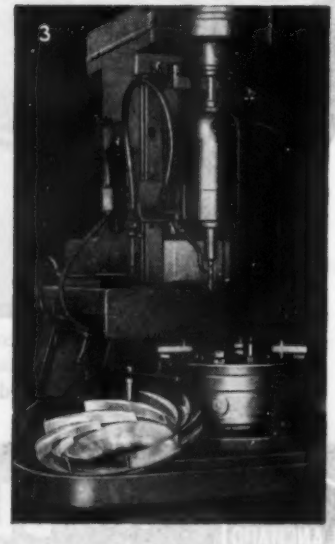
On the basis of time and money saved, these machines are an excellent investment. Perhaps there are opportunities for similar savings in your present or prospective production program. We invite your inquiries. *Snyder Tool & Engineering Company, 3400 E. Lafayette Avenue, Detroit 7, Michigan.*

20 Years of Successful Co-operation with Leading American Industries

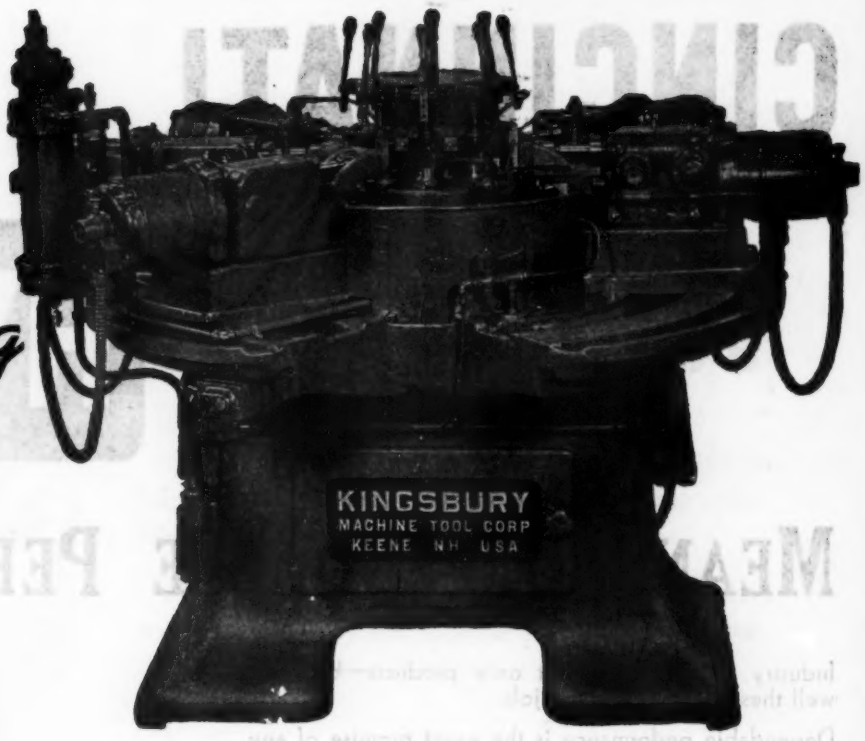
SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST



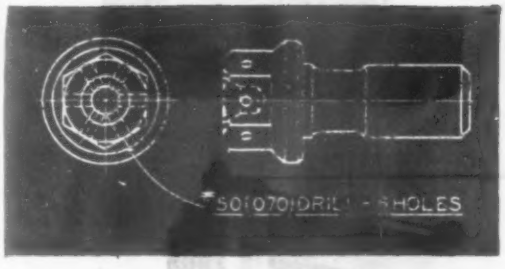




Loading and Unloading While Drilling assures Continuous High Production



FLEXIMATIC



by KINGSBURY

THIS IS A FLEXIMATIC AIRPLANE JOB!

Kingsbury Standard Units for drilling, reaming, boring, spotfacing and milling can be mounted in any combination, operated automatically and changed over quickly and easily to suit the requirements of the work to be handled.

This six-spindle FLEXIMATIC is set up for drilling lacing holes in the heads of screws for airplane motors. High production, so essential to parts involved in the speeded up program of this important phase of National Defense, is being achieved with minimum effort on the part of the operator.

The main turret of this FLEXIMATIC contains eight individual turrets which index 60° at each index of the main turret. Each of the six automatic drilling units on the machine drill a hole from the outside face of the hex head into the center only. The operator merely loads and unloads at the loading station while the holes are being drilled at the other stations on the machine. All six drilling operations are performed in a single chucking of the work.

Speed, convenient handling, accuracy and continuous production are universally recognized advantages offered by FLEXIMATICS regardless of the nature of the job assigned them to handle. The specific work being performed here is typical of many others where FLEXIMATICS are the machines for jobs calling for the maximum in time savings.

KINGSBURY MACHINE TOOL CORPORATION
KEENE NEW HAMPSHIRE U.S.A.

CINCINNATI

HYPRO

MEANS DEPENDABLE PERFORMANCE

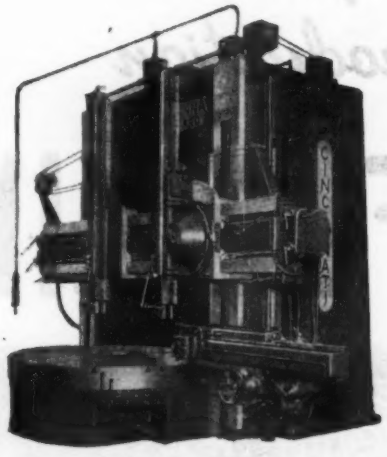
Industry actually buys not only products—but how well these products do the job.

Dependable performance is the exact promise of any Hypro—a promise that has been kept for over half a century.

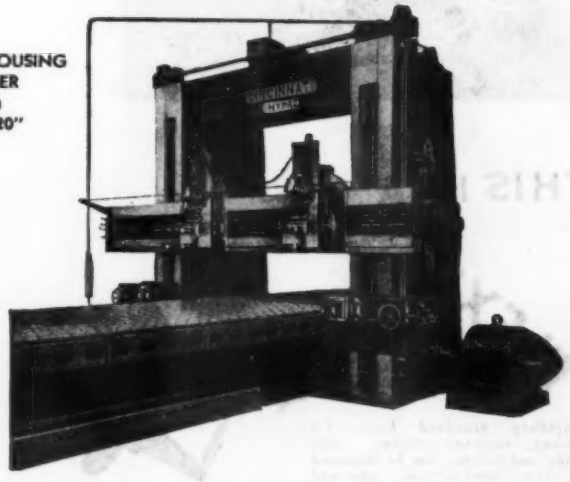
Leaders in practically all industrial fields almost without exception use Hypro machines in the products they make. Low cost operation, faster production, lower maintenance are basic integral parts of all Hypro machines.

That is why engineers, not only in America but all over the world, recognize the advantages inherent in Hypro Machines.

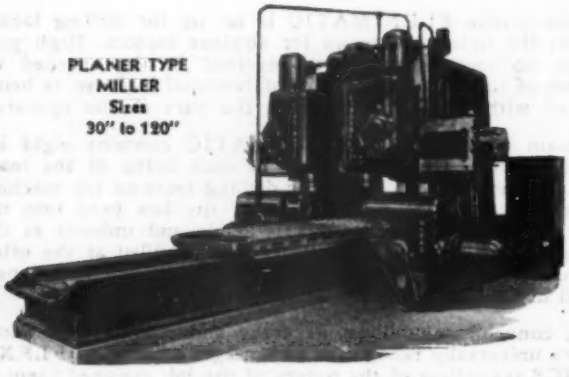
Let us help you solve your peacetime problems. For a complete line of Hypro Machines write for catalog No. AM-154.



VERTICAL BORING MILL
Sizes
8' to 12'



DOUBLE HOUSING PLANER
Sizes
24"—120"



PLANER TYPE MILLER
Sizes
30" to 120"

THE CINCINNATI HYPRO PLANER COMPANY

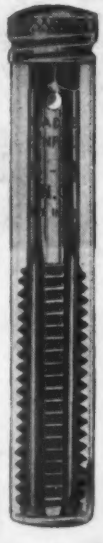
PLANERS - BORING MILLS - PLANER TYPE MILLERS

CINCINNATI, OHIO

HOW TO SELECT *The Right Tap* FOR THE JOB

First, use this handy Threadwell pocket slide Tap Selector.* It tells you the right *kind* of tap, the right lubricant and the right tapping speed—at a glance.

Then, select the *make* of tap that meets the highest standards of quality and accuracy and at the same time throws in all these extra advantages:



COLD-TEMPER, a feature of every Threadwell high speed tap. 120° below zero treatment that means greater strength with less brittleness—more and better threads per tap, not only on steels, cast iron and alloys but on plastics and other abrasive materials.

Color "i-dot-ification"—a sure, quick way to identify the right tap for the job after you've selected it—*red* dot for cut thread, *white* for commercial ground, *blue* for precision ground.

Tap-Capsule—a transparent plastic, metal-capped tube for individual protection of every ground thread tap. You select the right tap before you unwrap.

Greaseless rust-proofing—taps that are always clean, dry, ready to use.

"Personal attention" service—a local source of supply that meets your needs promptly and intelligently backed by a tap manufacturer that specializes in personal attention to every order.

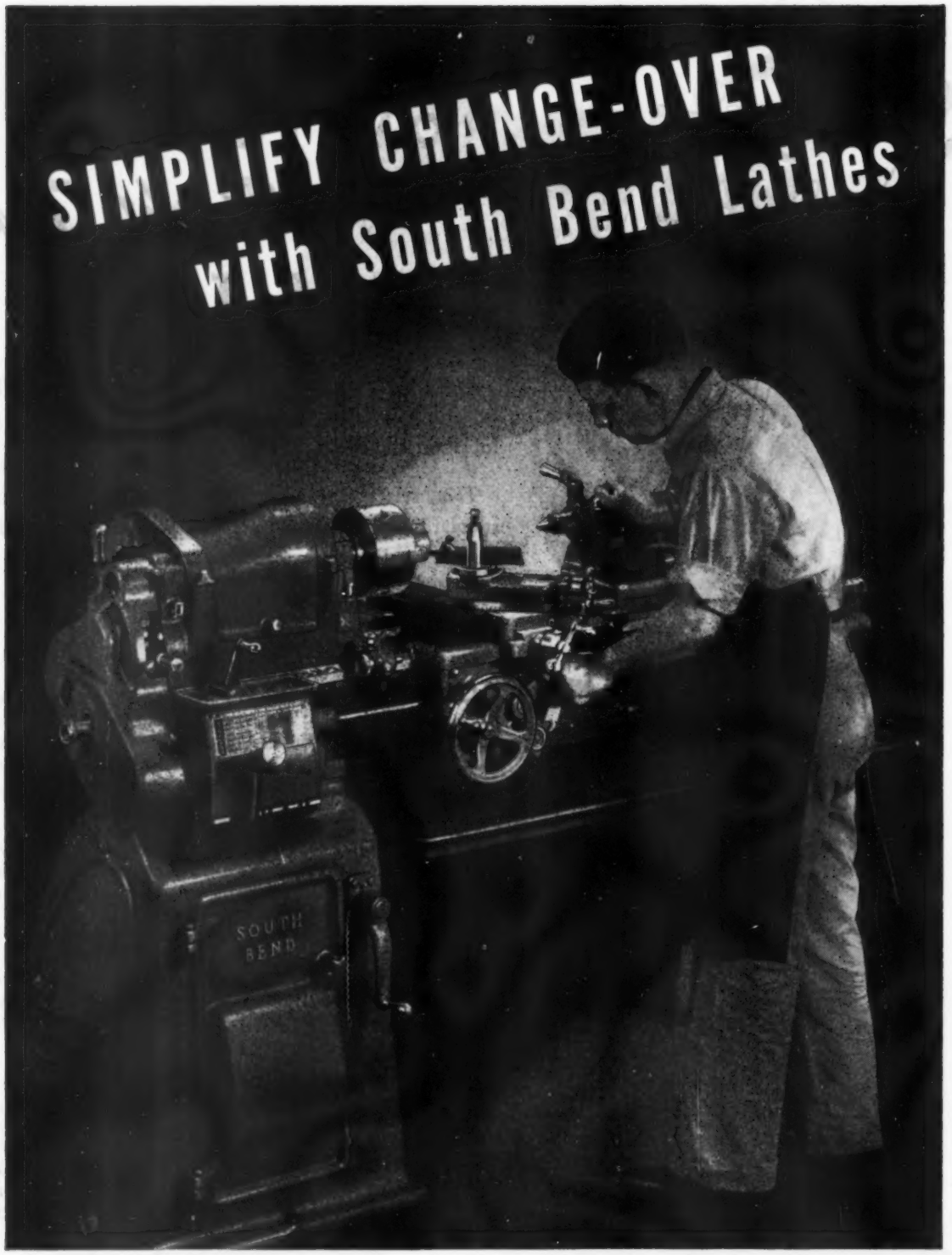
*Ask your Threadwell distributor for the Threadwell Tap Selector or write your name, position, company address and "send Tap Selector" on a postcard and we'll send you one by return mail.

DISTRIBUTORS IN LEADING INDUSTRIAL CENTERS THROUGHOUT AMERICA
EXPORT STOCKING DISTRIBUTORS
CANADA, Bridge Machinery Co., Montreal;
ENGLAND, Skylux Ltd., London and John H. Graham and Co., Inc.
THROUGHOUT THE WORLD

Threadwell
SINCE 1902
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY • GREENFIELD, MASSACHUSETTS, U. S. A.
CALIFORNIA OFFICE, THREADWELL TAP & DIE CO. OF CALIF., 1322 SANTA FE AVE., LOS ANGELES 21

SIMPLIFY CHANGE-OVER with South Bend Lathes



Change-over from war production to the manufacture of civilian products is comparatively simple where versatile South Bend Lathes are used. Their adaptability permits getting new jobs into production quickly—with little inconvenience or loss of time. A complete line of practical attachments and accessories makes it easy to tool up the lathe for a wide variety of operations. Often the use of special machines and fixtures can be avoided, thus preventing capital losses resulting from the inevitable scrapping of costly custom-built equipment with each change in product design.

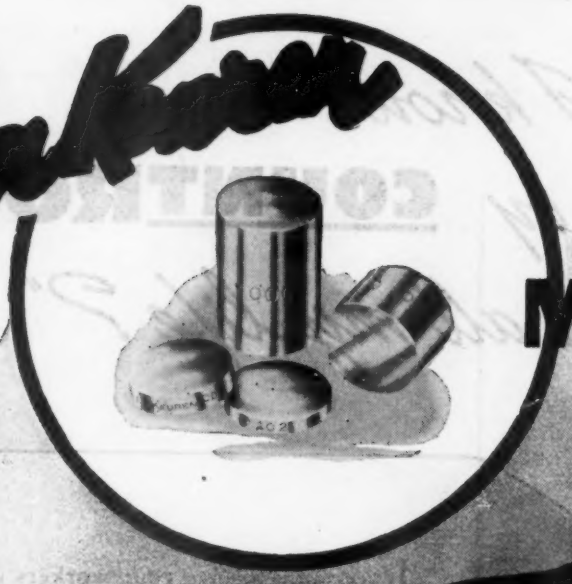
WRITE FOR NEW CATALOG 100-D

Illustrates in full-color and describes South Bend Engine Lathes and Toolroom Lathes with 9", 10", 13", 14½", and 16" swings. Also, Precision Turret Lathes with ⅛" and 1" collet capacities.

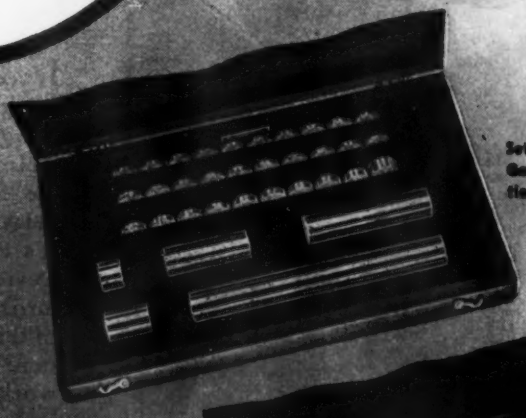
SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • SOUTH BEND 22, INDIANA • *LATHE BUILDERS FOR 38 YEARS*

Van Keuren

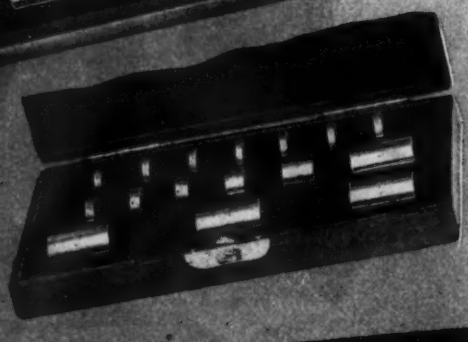


MICROGAGES



Set MTT MICROGAGES. 35 Gages giving 140,000 combinations $95.00

Set MT MICROGAGES. Over 5,000 combinations in thousandths $35.00



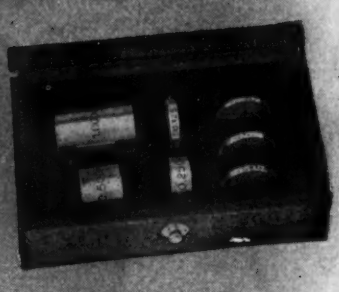
A FOUNDATION FOR ACCURACY FOR 25 YEARS

VAN KEUREN MICROGAGES are high precision working gages, designed for use on all ordinary work and economically practical for use in production because of their low cost. Their great value in general shop use lies in the fact that they enable the workman to achieve the accuracy required by the inspector.

MICROGAGES are of first quality oil hardening alloy tool steel, exceptionally hard, carefully seasoned, with accurately flat and parallel mirror-like surfaces. They combine readily by wringing together and because of their size (11/16" dia.) are ideally suited for checking heights, widths, slots, machine set-ups, gage setting and many other uses. They are made round in order to assure the best distribution of wearing surface, which is about equal to that of rectangular gage blocks.

MICROGAGES up to 1" in length have a tolerance of plus .000015" minus .000010". They average 5 millionths of an inch oversize which provides the WEAR ALLOWANCE feature of these gages.

VAN KEUREN MICROGAGES are available in sets especially designed for general shop use, for gage setting and for toolmakers and machinists. Individual MICROGAGES in standard sizes are also available in a size up to 6" in length.



Toolmakers MICROGAGE SET M64. Gives 121 combinations $13.00

Complete details on MICROGAGES and the full line of Van Keuren Precision Measuring Tools are contained in Catalog No. 33, a 160-page manual for toolmakers, machinists and inspectors—sent promptly on request.

Van Keuren

25th YEAR

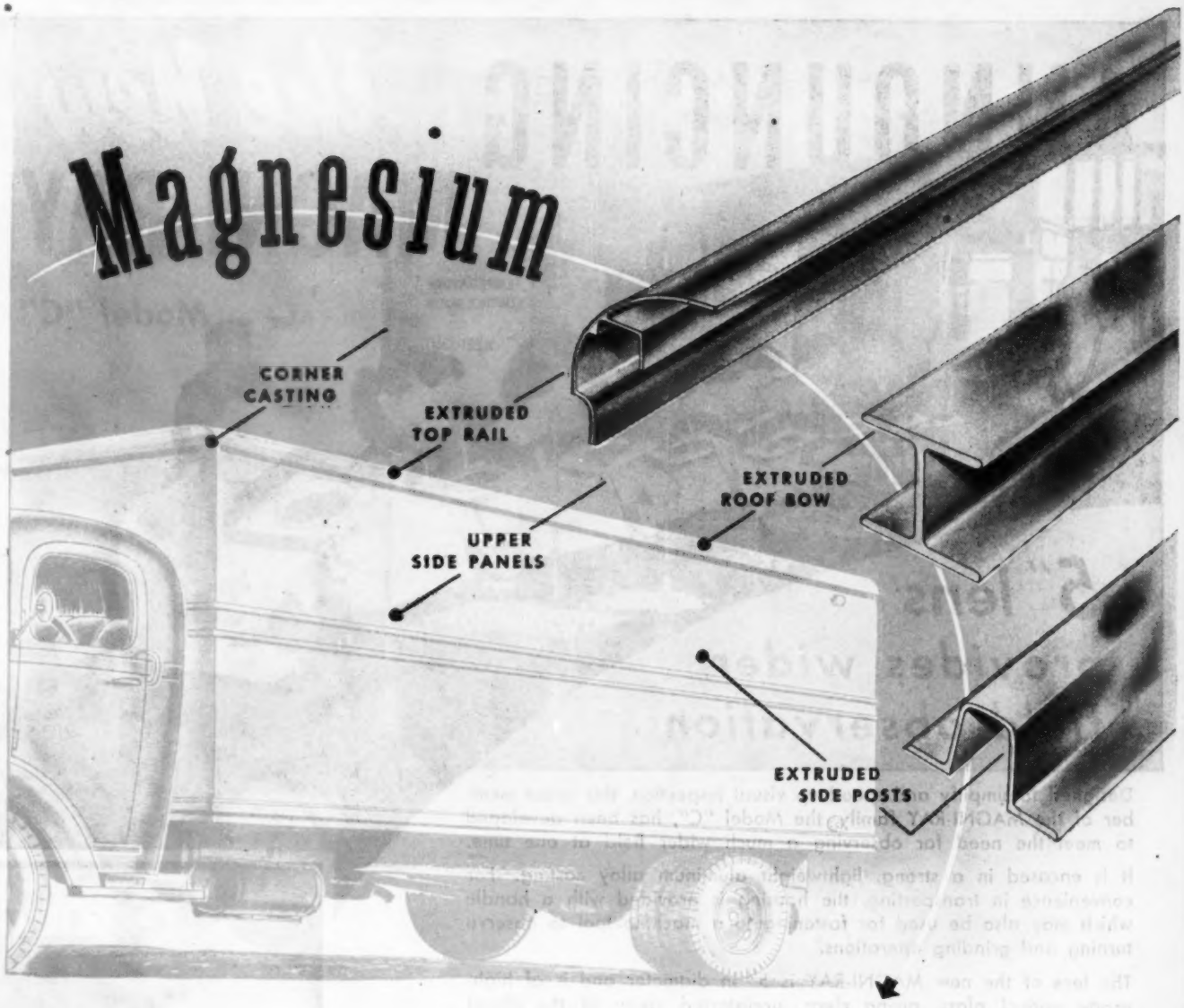
"Now I know what they mean by COUNTROL ... where's it been all my life?"

If you want to give your workers a lift in spirits and output, give them Veeder-Root *Countr*ol on their machines. It will lift from their minds the burden of guesswork and the fear of uncounted errors, shipment-delaying shortages, and wasteful over-runs. It's easy to install Veeder-Root Counting Devices to keep a running count of strokes, turns, pieces, or other performance-units of their machines. Then they can see at any time where they stand in relation to the work-schedule . . . avoid any miscounts . . . and spot any mechanical lags in their machines. Interdepartmental co-ordination will improve. The whole plant will run more smoothly. So let Veeder-Root engineers show you what a simple matter it is to install complete *Countr*ol on all machines.

PS: And if you want to give your own product a lift in *marketability,* build into it a Veeder-Root Device as an extra service to your customers . . . to help them get out of your product all the performance you build into it.

VEEDER-ROOT INC., HARTFORD 2, CONN.

In Canada: Veeder-Root of Canada, Ltd., Montreal
In England: Veeder-Root Ltd. (New address on request)



...makes a Big Difference in Topside Weight of Truck Bodies

There are so many places where magnesium can save weight! Side posts, roof bows, top rails, and other extruded shapes, clip angles, upper side panels, roof sheeting and corner castings. Many more applications for magnesium may come to light when talking it over with our engineers.

Savings of around half a ton on a single job can be accomplished by designers who think in terms of magnesium. They know that lighter weight means higher efficiency, lower operating costs and greater payloads.

Call on us to assist you in employing the weight-saving properties of magnesium to best advantage. Write to Aluminum Company of America, Sales Agent for Mazlo Magnesium Products, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

MAGNESIUM MAZLO PRODUCTS

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AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

ANNOUNCING...the New MAGNI-RAY

Model "C"

5" lens provides wider field observation

Designed to simplify and speed up visual inspection, this latest member of the MAGNI-RAY family, the Model "C", has been developed to meet the need for observing a much wider field at one time.

It is encased in a strong, lightweight aluminum alloy casting. For convenience in transporting, the housing is provided with a handle which may also be used for fastening to a machine tool to observe turning and grinding operations.

The lens of the new MAGNI-RAY is 5" in diameter and is of high-grade optical glass, giving clear, undistorted vision of the object under inspection. Housing is attached to a 16" upright rod extending from the base. A universal clamping device permits the lens with its housing to be swivelled up-and-down and side-ways as required. The magnifying device is supported by a 12"x12"x12" triangular cast iron base of sufficient weight to provide rigidity and stability and to prevent tilting.

Light is directed upon work from two 4" long 25-watt tubular bulbs mounted in MAGNI-RAY, the inside of the case being specifically silvered for reflection purposes.

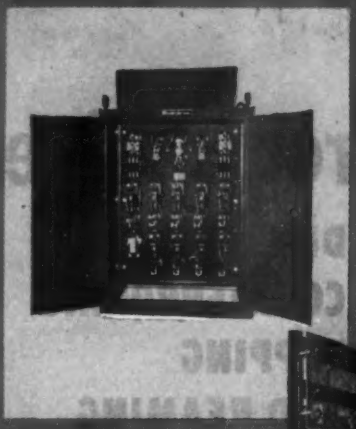
The new Model "C" MAGNI-RAY is especially adapted for detecting cracks, imperfections and blow holes in large castings. It is ideal for military map reading, as well as for use in assembling small, delicate mechanisms, inspection of ground, polished or lapped surfaces. Burrs, surface defects and other imperfect workmanship, not readily apparent to the unaided eye, are quickly detected by means of this new instrument. Inspection, receiving, drafting, machining departments and even first aid rooms have many uses for the MAGNI-RAY because of its almost unlimited field of application.

The MAGNI-RAY is wired for use on 110 volt current, A.C. or D.C. Full information is available promptly on request. Price—complete instrument, with stand, bulbs, electric cord and plug.....$29.70 net

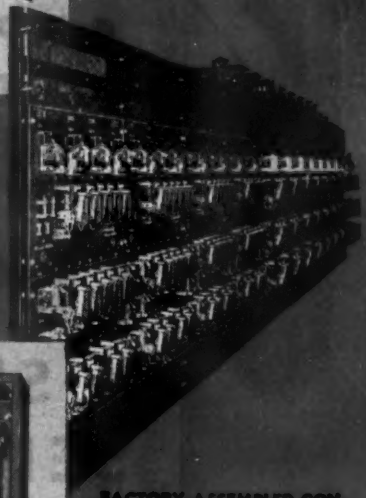
Using the MAGNI-RAY by hand for critical inspection of precision parts.

Magnification and visibility of parts inspected by MAGNI-RAY are clearly apparent here.

GEORGE SCHERR CO.
INCORPORATED
200 LAFAYETTE STREET NEW YORK 12, N. Y.

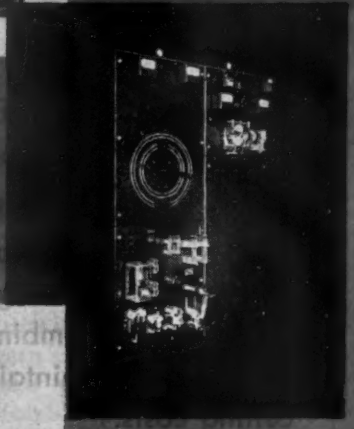


CONTROL for constant-voltage planer drives . . . or other reciprocating machinery, shown at the left.



HEAVY-DUTY CONTROL of magnetic type for constant or adjustable speed motors used in machine tools or other operations requiring inching or jogging, below.

FACTORY-ASSEMBLED CONTROLLERS for steel mill auxiliary service, above.



CONTROL PANEL used with Rototrol for single-motor paper machine drives, right.

DEAD-FRONT TYPE CONTROL PANEL for operation of constant-voltage dynamometers, shown at left.

For any D-C Control

A MOTOR STARTER OR COMPLETE MILL CONTROL

Check Westinghouse

You may never need these specialized controllers shown on this page—for cranes, planers or paper machines—but the same excellence in engineering, design and manufacture goes into every Westinghouse control device. Should your particular problem require special help, call a Westinghouse engineer to review your requirements and make the necessary recommendations.

Westinghouse motor control covers the entire range of standard a-c and d-c controls and accessories for every type of drive, plus many specialized types of control shown here. For help on any control problem, it pays to first call Westinghouse. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60608

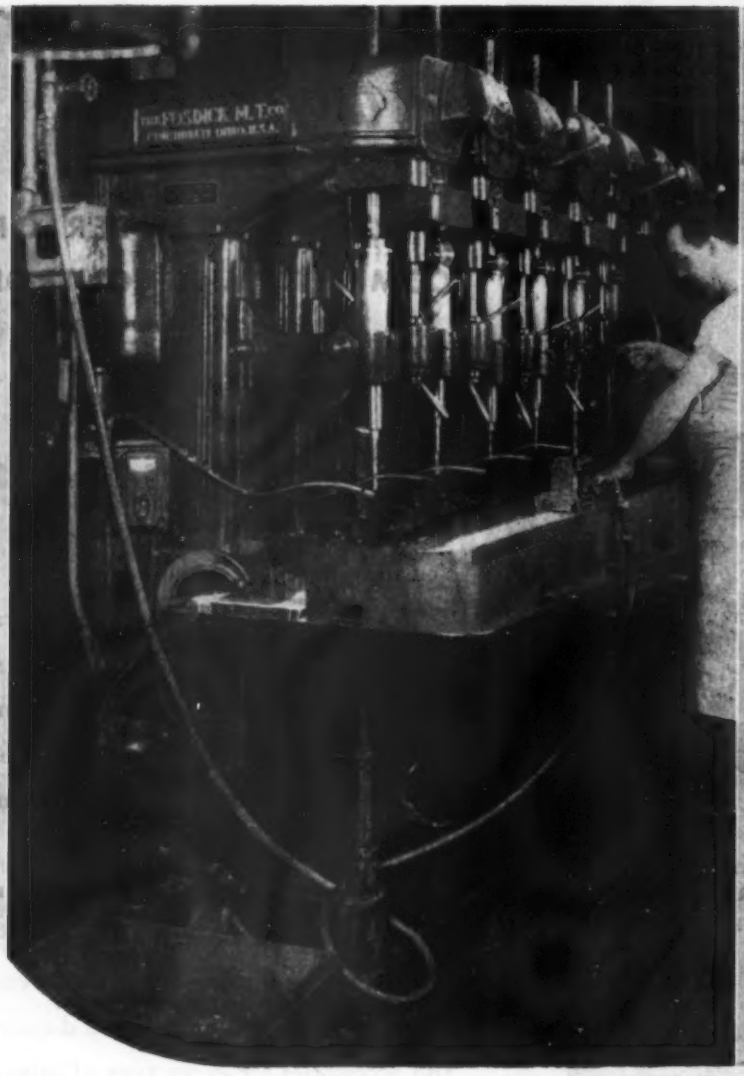
Send for this booklet

The entire range of Westinghouse standard motor control is covered in this 290-page Buying Data Book. If you do not have a copy, phone your Westinghouse office for Catalog No. 7000.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Motor Control



Progressive

- DRILLING
- COUNTERBORING
- TAPPING
- AND REAMING OPERATIONS ON A

FOSDICK 6-SPINDLE SENSITIVE DRILL

● On this Fosdick 6-Spindle Sensitive Drill the first two spindles drill and counterbore one hole, the next two drill and tap another hole and the last two drill and ream a third hole.

A box jig is used to hold the work permitting several operations to be performed in sequence without removing work from the jig. This method of operation not only speeds up the work but assures accurate duplication of holes.

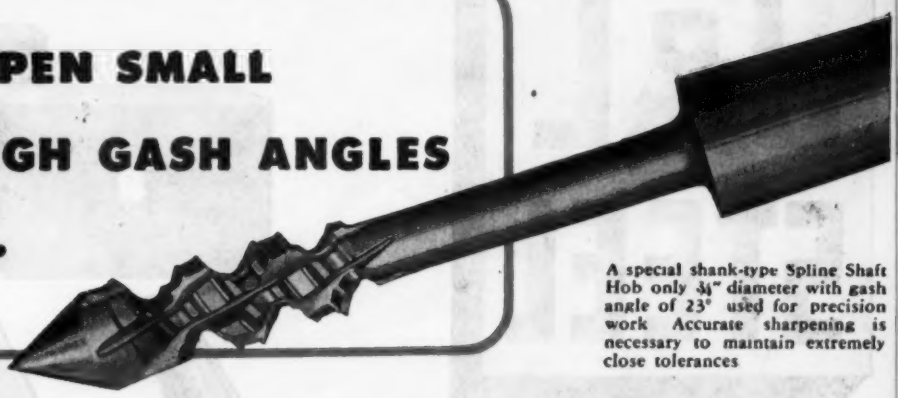
Thousands of Fosdick Sensitive Drills are working in hundreds of production shops, some singly, some in various multiple combinations speeding production — maintaining accuracy — cutting costs.

Why not put Fosdick Sensitive Drills on your small hole operations —up to 1½ inch?

Write for Bulletin H.S.A.

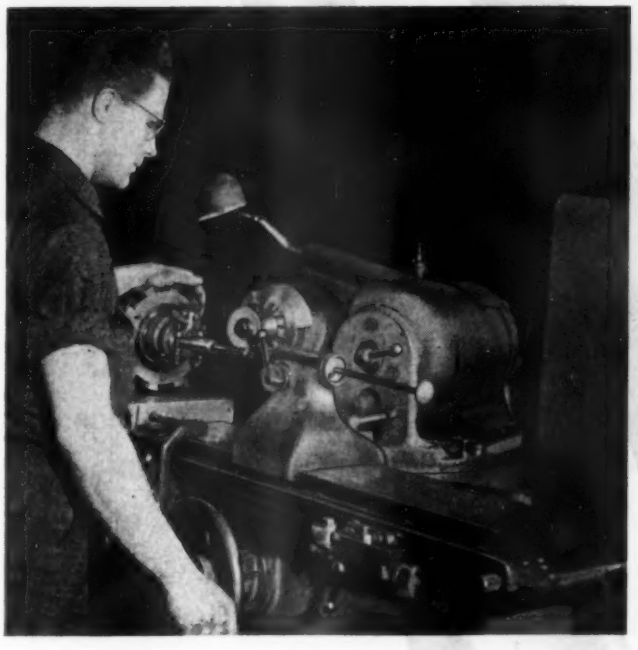
FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

HOW TO SHARPEN SMALL HOBS WITH HIGH GASH ANGLES ACCURATELY...



A special shank-type Spline Shaft Hob only ¾" diameter with gash angle of 23° used for precision work Accurate sharpening is necessary to maintain extremely close tolerances

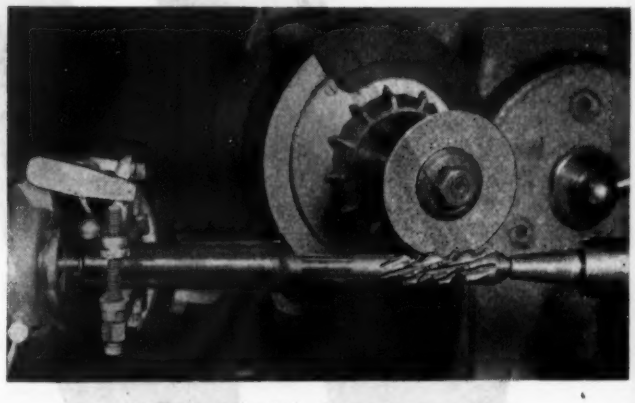
USE THE BARBER-COLMAN "MODEL HRS." COMBINATION SHARPENING MACHINE



Sharpening the hob shown above on a Barber Colman "HRS" Combination Sharpening Machine, to retain its original accuracy

It is easy enough to buy a precision hob, but to maintain the original accuracy of that hob when sharpening it is often something else again. Most precision hobs can be accurately sharpened on the well-known Barber-Colman Automatic Hob Sharpening Machines, but occasionally it is necessary to sharpen hobs with smaller diameters or shorter lead of gash than can be handled on these machines. In such cases, equally accurate results can be obtained by using the Barber-Colman "HRS" Combination Sharpening Machine

This machine has a wide range of capacity and is capable of being set up for very small work and short helical leads which must be held to extremely close tolerances Thus it is ideally suited for work which falls below the range of the standard Automatic Hob Sharpeners For example, the precision hob shown above is only ¾" in diameter and has a gash helix angle of 23°. This hob is used to cut splines to a tolerance of only .0003" on key width so the gash angle and spacing must be accurately maintained in sharpening. This is easily accomplished on the "HRS" Combination Sharpening Machine, as shown in the accompanying pictures



Close-up of the hob sharpening operation shown at the left. The original tooth spacing and helix angle is accurately reproduced.

The "HRS" is also capable of handling many types of reamers and formed and profile type milling cutters, all with an equally high degree of accuracy on a wide variety of work It will be found to be an extremely versatile and useful machine wherever a considerable amount of precision sharpening is needed. *Write today for our descriptive bulletin on the "HRS" Machine and learn what you can do to retain accuracy in precision cutting tools.*

BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

J&L STEEL

Our metallurgical engineers will be glad to discuss your production problems with you.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PENNSYLVANIA

SPECIAL COLD DRAWN SHAPES SAVE MACHINING

BENEFIT from the highly specialized knowledge that enters the manufacture of Brown & Sharpe Milling Cutters—the careful selection of steels—the scientific heat treatment individualized for the type of service a particular cutter must render—and designs that result from extensive research and experimentation. With these good cutters, work is finished accurately—and finished fast. The Brown & Sharpe "know-how" of cutter manufacture pays dividends in completed jobs—Brown & Sharpe Cutters get the work out.

Catalog No. 34 showing complete line of cutters sent on request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

There's a
BROWN & SHARPE MILLING CUTTER
for Most Milling Needs

PLAIN • COARSE-TOOTH
HELICAL PLAIN
STAGGERED TOOTH SIDE
SIDE • HALF SIDE
INSERTED TOOTH • END MILLS
SHELL END MILLS
ANGULAR • CONVEX • CONCAVE
CORNER-ROUNDING
METAL SLITTING SAWS
SCREW SLOTTING
SPROCKET WHEEL
GEAR

. . . We urge buying through the Distributor

B·S

BROWN & SHARPE CUTTERS

NOW—IT'S EASY TO ORDER COATED ABRASIVES

. . . use this new marking system

NO matter what type of Coated Abrasive Product you use . . . you can *identify it quickly* . . . and *order it easily* when you specify Coated Abrasives by "CARBORUNDUM." A new system has just been developed by "CARBORUNDUM" to help you save time and assure you of easier product identification. Here's how it works:

1—END USE IDENTIFIES PRODUCT

Coated Abrasive Products produced for you by "CARBORUNDUM" have been given names that indicate their use in *your* shop. For instance, in auto repair shops, "Industrial Cloth," "Metal Cloth" and "Waterproof Paper Discs" would be the products you require.

The new names are simple. They describe the product you need. And they are easily remembered by your plant personnel.

2—SPECIFICATIONS ARE PLAINLY LISTED

To assist you further in specifying the correct Coated Abrasive, the specifications are plainly marked. They are: Grit Size; Backing; Type of Abrasive; Type of Coating; and Finish, on both the *labels* and the *backing materials* of the entire line of Coated Abrasive Products manufactured by The Carborundum Company.

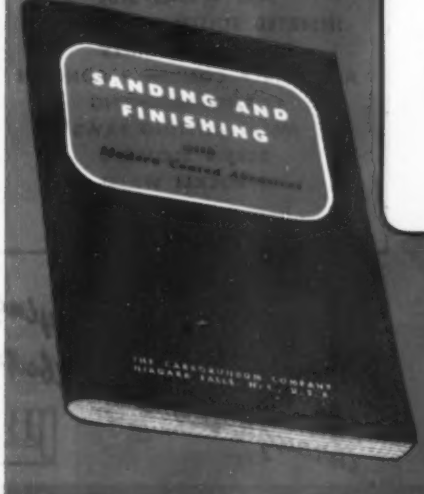
3—COLORFUL LABELS PROVIDE QUICK IDENTIFICATION

New labels have been designed for the entire line to give prominent display to product names and specifications. They are printed in two colors . . . red and black . . . these labels can be easily and quickly located in your stock room.

SEND FOR THIS NEW BOOK

It provides important information about Coated Abrasive Products and their uses.

1 Sanding and Finishing Processes.
2 Abrasive Grains.
3 Classification of Grain Sizes.
4 Bonding Materials.
5 Coatings.
6 Backing Materials.
7 Flexing.
8 Suggestions for stocking.
9 How to identify and specify Coated Abrasive Products by "CARBORUNDUM."
10 Recommendations for Belt Splices.
11 Machine specifications for Belt sanding.
12 Specifications for Standard Coated Abrasive Products.



IT'S FREE—

MAIL THE COUPON NOW!

This new book "Sanding and Finishing" will be issued free to all bona fide manufacturing plants using Coated Abrasive Products in production operations.

Act now. Write today for your copy . . . or fill in the coupon and attach it to your company letterhead.

THERE IS A PRODUCT BY

CARBORUNDUM

TRADE MARK

FOR EVERY ABRASIVE APPLICATION

The Carborundum Company
Niagara Falls, N. Y.

Please send me my free copy of "SANDING AND FINISHING"

Name.....

Firm.....*Title*.....

Address.....

("CARBORUNDUM" is a registered trade mark of and indicates manufacture by The Carborundum Company)

Aluminum gives you

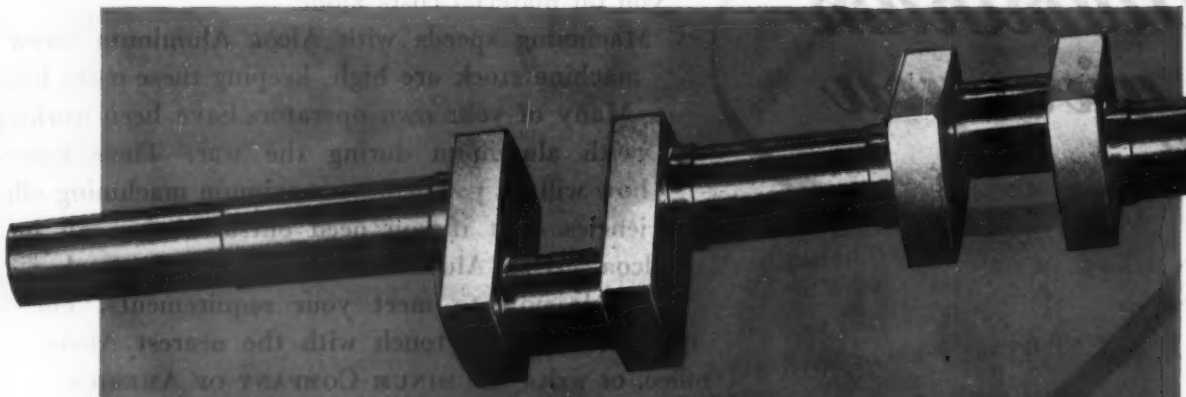
Three times as many feet of screw machine stock per pound—three times as many finished parts—because aluminum weighs only one-third as much as the heavy metals. Figure what this will save you on material costs alone.

Machining speeds with Alcoa Aluminum screw machine stock are high, keeping these costs low. Many of your own operators have been working with aluminum during the war. Their know-how will let you achieve maximum machining efficiencies. But if you need outside help, call on Alcoa. Alcoa Aluminum screw machine stock is available now to meet your requirements. For quotations, get in touch with the nearest Alcoa office, or write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM

ONE G&L REPLACES FOUR



Crankshaft Production Time Cut 50%

Similar Savings on BED PLATES, CYLINDERS, MANIFOLDS, YOKES and CLUTCH BASES

● Confronted with the problem of stepping up production, a progressive midwest Diesel manufacturer found that more engines could be produced by using a G. & L. Horizontal Boring, Drilling and Milling Machine for numerous operations. Many major engine parts ordinarily routed over four other types of machines were handled faster and more accurately on one G. & L. machine. As a result, overall production was increased because less machining time and handling was required. In many cases only one work setup was necessary for all operations.

Following is a list of the major engine parts which were taken off of the four machines and handled on the single Giddings & Lewis machine.

Crankshafts	Mill flats of webs
Engine Bed Plates	Mill both ends
Crankcase	Mill four sides
Cylinders	Mill exhaust ports, intake ports, water jacket clean-out bosses and air compressor bosses.
Exhaust Manifolds	Mill bosses on three sides
Exhaust Yokes	Mill three flanges
Clutch Bases	Mill both ends
Main Bearing Caps	Mill both ends
Reverse Gear Brake Bands	Mill two round bosses with special turning tool

To increase production still further, this machine was equipped with a standard rotary and auxiliary table and a special turning tool which reduced the number of setups and permitted more machining operations per setting.

Negative Rake Milling Used on Crankshafts

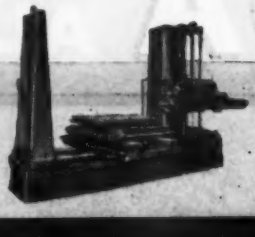
It was found that the alloy characteristics of the crankshafts created a difficult machining problem. This was overcome by negative rake milling. Actual machining time using a *negative rake milling* cutter was but a fraction of the floor-to-floor time. Gauging and setting the work require the most time.

Meeting Present and Future Production Demands

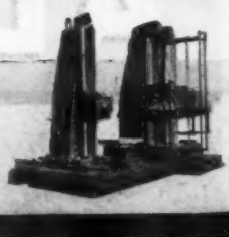
If you have not already considered flexible and versatile G. & L. machines for *production* as well as specialized work, now is the time to consult our engineers. They will be glad to show you how G. & L. Horizontal Boring, Drilling and Milling Machines and timesaving accessories will enable you to meet present and future competition.

GIDDINGS & LEWIS

138 DOTY STREET



Right: G. & L. Table Type Machine.



Right: G. & L. Floor Type Machine.

other type machines in diesel plant *

(Left) 340-T G.&L. Horizontal Boring, Drilling and Milling Machine with crankshaft ready to be machined.

KAHLENBERG BROS. CO.
TWO RIVERS, WIS. . . . Producers of Marine and Stationary Oil Engines.

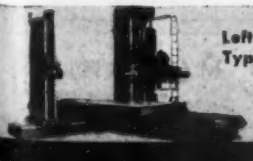
(Below) Close-up showing negative rake milling cutter in operation. Note mirror-like finish produced.

CRANKSHAFT PRODUCTION FACTS

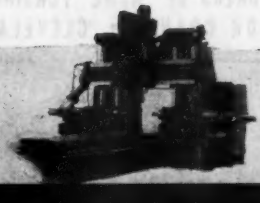
Machine:	340-T G. & L. Horizontal Boring Machine with extended saddle, saddle supports and runway.
Cutter:	Negative Rake Carbide 4" diameter.
Material:	.45 carbon heat treated steel—220 Brinell hardness.
Length of Crankshaft	12'-2" long overall
Diameter of Crankshaft	6"
Number of Throws	4
Weight	2000 lbs.
Width of Cut	3"
Distance of Cut	13"
Spindle RPM	450
Feed in Inches per Minute	20
Depth of Cut	3/16 to 1/4"
Number of Faces Milled per Crankshaft	16
Total Time Required	4.91 hours

FREE . . . Field Production Facts will help you solve difficult machining problems. Write today for your copy of Trade Journal Advertising covering advanced G. & L. machining methods. Please indicate your business connection.

MACHINE TOOL CO.
FOND DU LAC, WIS.



Left: G. & L. Planer Type Machine



Left: G. & L. Multiple Head Type Machine

THE SURFACE GRINDER HAS *Proven* ITSELF *Indispensable!*

No longer is the Surface Grinder considered a special or single purpose tool. It has proven itself indispensable, and filled a much needed demand by increasing the output of precision tools and parts required for vital Military Programs. Likewise, it will be an indispensable tool in the Reconversion and Post War period.

Investigate the many features and advantages of the *"Hill" Open Side* Horizontal Spindle Hydraulic Surface Grinder in your planning for efficient and low cost manufacture of peace time products. Also built in the Vertical Spindle design in a full range of sizes.

HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

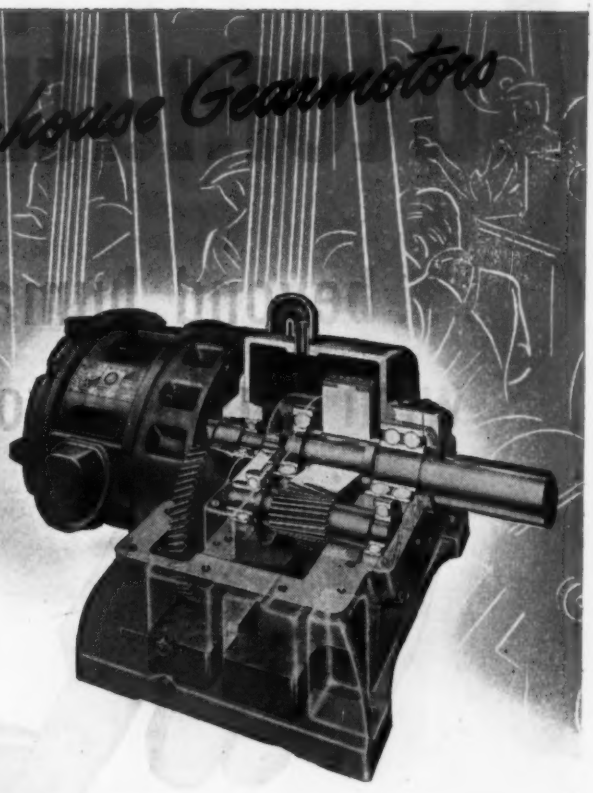
6400 BREAKWATER AVENUE • CLEVELAND 2, OHIO

"HILL" HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING • TAPPING MACHINES
"CANTON" ALLIGATOR SHEARS AND PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES AND SHEAR BLADES

Nine good reasons for *Modernizing with Westinghouse Gearmotors*

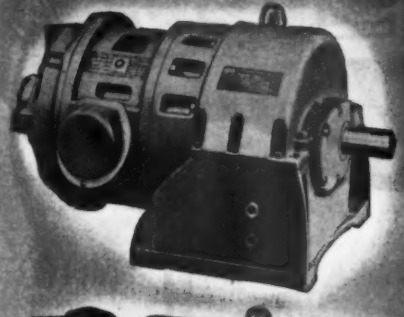
on drives from 1 to 75 hp

1. FEWER PARTS TO WEAR
2. BPT "TOUGH-HARD" GEARS AND PINIONS
3. USE ALL WESTINGHOUSE MOTOR TYPES
4. HIGH EFFICIENCY
5. POSITIVE LUBRICATION
6. EASY ACCESSIBILITY
7. IMPROVED FOUNDATION STABILITY
8. MOTOR AND GEARS BUILT BY ONE MANUFACTURER
9. DESIGNED AND APPLIED TO A.G.M.A. STANDARDS

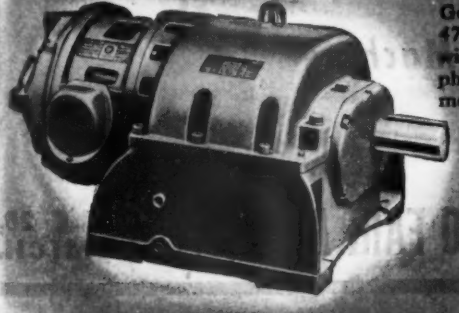


There is a Westinghouse speed reduction unit for most applications

TYPE A GEARMOTOR—Single-reduction unit. Gear ratios 1.22, 1.50, 1.84, 2.24, 2.73, 3.37, 4.17, 5.00, 6.25. Available with single-phase, polyphase, and direct current motors.



TYPE C GEARMOTOR—Double-reduction unit. Gear ratios: 7.61, 9.21, 11.3, 14.0, 17.5, 20.8, 25.7. Available with single-phase, polyphase, and direct current motors.



TYPE E GEARMOTOR—Double-reduction unit. Gear ratios: 31.2, 38.9, 47.3, 52.7, 58.3. Available with single-phase, polyphase, and direct current motors

In the last few years, machine drives have taken a terrific peak-load punishment. So it's natural that reconversion will require many replacements with modern, economical drives.

When drives require speed reduction... and four out of five do... use a gearmotor. Specifying gearmotors simplifies ordering and delivery... saves installation expense because the complete drive is in one "package".

Westinghouse offers a complete line of gearmotors for speed-reduction drives up to 75 hp, and a complete line of similar speed reducing units for drives up to 1000 hp. Call your Westinghouse Office for information, or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

J-07229

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Gearmotors

Automatic Precision

. . . beyond human skill with push-button control

The Model 3-B JIGMIL

PROVIDES accuracy beyond human skill by push button control.

Automatic positioning between holes is controlled to within less than one ten-thousandth part of an inch.

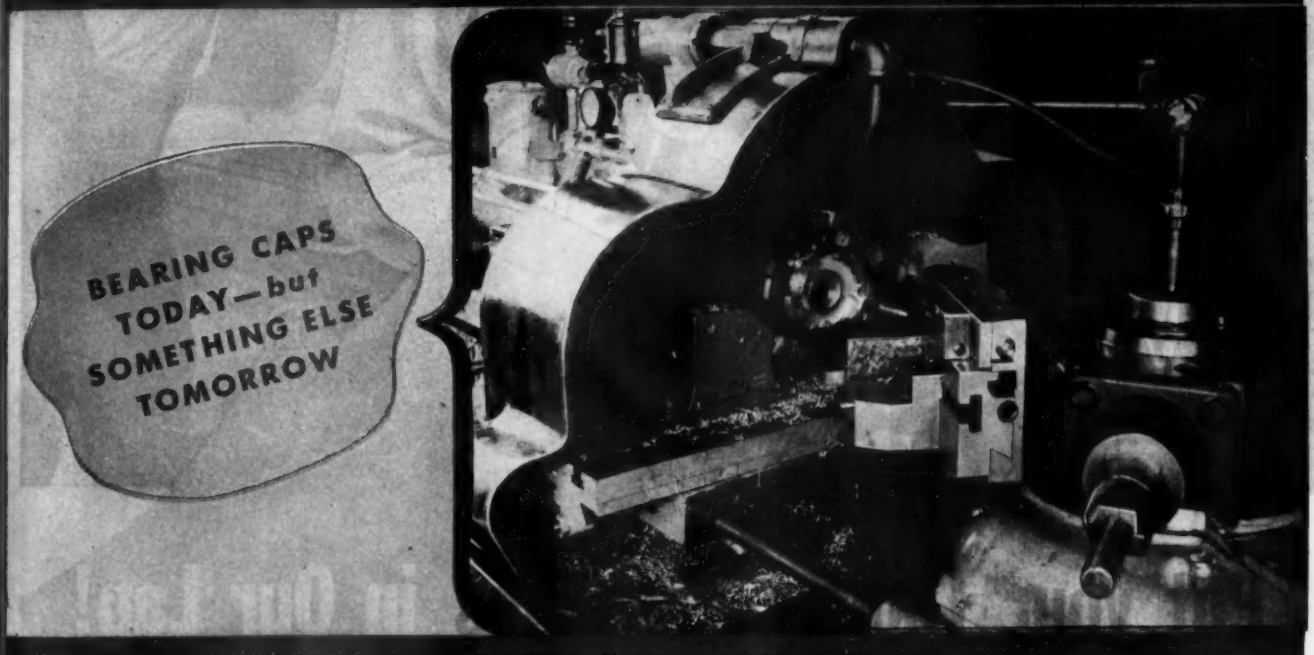
Retraction and repositioning of the work for measuring or tool changing is by push button operation.

Any function is responsive to this centralized finger tip control.

The World's Finest BORING and Milling Machine

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

Now's the time to look into the Retooling Possibilities--of your P & J EQUIPMENT...



Probably most P & J machines on war work today will soon have other jobs to handle. The type 4D H.S. P & J Automatic is no exception. As shown here it is busy turning out bearing caps in a nationally-known shop, maintaining close tolerances, keeping costs down and holding to fast production schedules.

This machine, however, is not shackled to the work it is doing. It can be readily changed over for the production of other parts by the comparatively simple procedure of re-tooling, with all original speed, convenience and accuracy retained.

Your P & J equipment can also be converted to other use. P & J engineers, with their long specialized experience in tooling, ian help you extend the utility of your machines. Why not find out immediately just what the possibilities are and how you can take advantage of them. Outline your problem and ask for our recommendations.

The POTTER & JOHNSTON MACHINE CO.
PAWTUCKET, R. I.

P & J REBUILDING
Service

P & J offers complete facilities in its shop for thorough rebuilding of customers' P & J Automatics. This service assures restoration of machines to original productivity and accuracy. Retooling can also be handled at the time of rebuilding.

IT'S THRIFTY — and PATRIOTIC—to save with BONDS . . .

Put your Tooling Problems in Our Lap!

Tooling is a tough problem. *But dealing with it is our business.*

Time after time, Pratt & Whitney engineers have been able to "de-kink" knots in production lines that looked hopeless.

Today, as the war swings into its secondary and final phase, next to on-time delivery of all war needs come thousands of reconversion problems that must be solved — *and fast!* As time goes on, these will become more and more urgent.

Our engineers are ready to work elbow-to-elbow with you the minute you say the word. Their experience and knowledge can go far toward helping you smooth out the rough spots and gear your set-up to the new production you are planning.

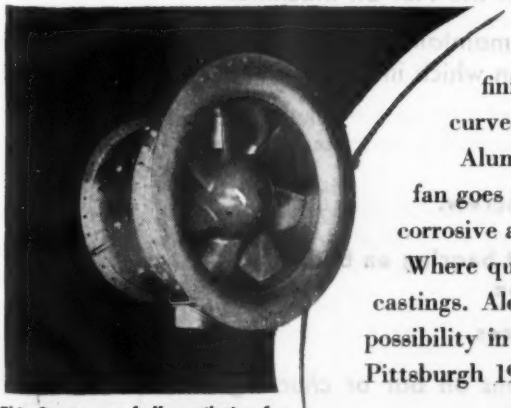
In the catalogs and other literature on our big line of machine tools, small tools, and gages are many helpful ideas and facts which you may not have had time to consider. Ask us to send you this material. And by all means, call in Pratt & Whitney engineers right at the start. It's *their* business to know *your* troubles. And just as P&W products are famed for their precision, P&W engineers are precision-minded concerning your tooling problems.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

Cast by Alcoa in a permanent mold



This Sturtevant hull-ventilation fan uses the aluminum rotor shown above.

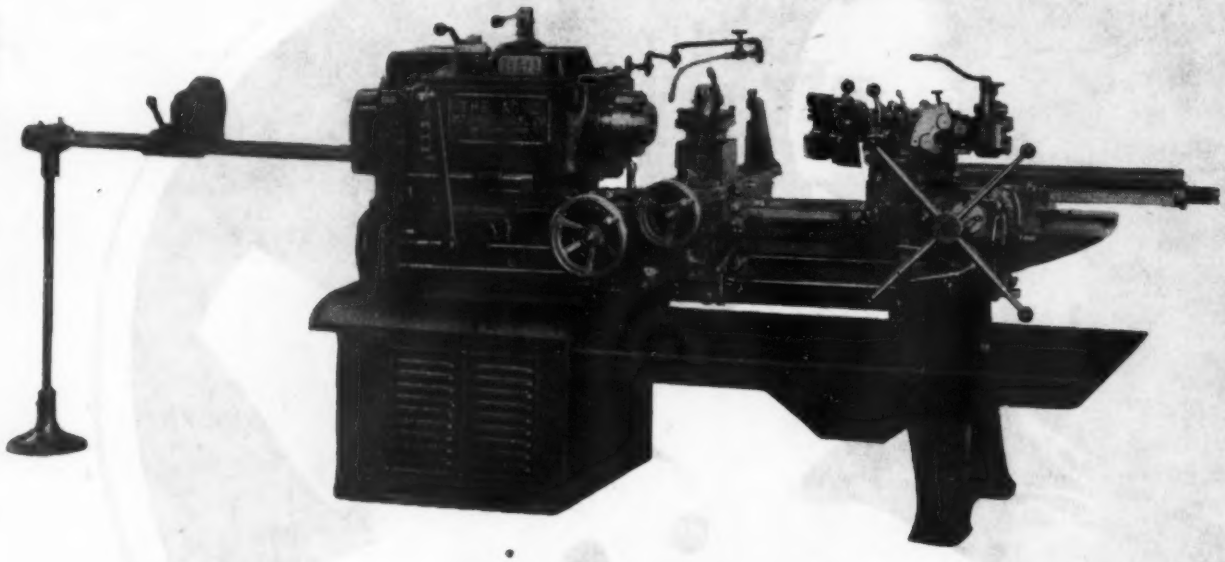
This permanent mold casting gives the manufacturer these advantages to start with: The blades need very little finishing. Think of the time and labor saved on the compound curves. And, because of uniformity, the fan is much easier to balance.

Aluminum contributes lightness, essential because this ventilating fan goes topside aboard ship. Aluminum resists the attack of the moist, corrosive air this fan pulls out of the ship's hull.

Where quantities warrant, it will pay you to change to permanent mold castings. Alcoa engineers will gladly help study your products with this possibility in mind. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM



ACME

RAM TYPE FOR BAR WORK

● This Acme Ram Type Turret Lathe is fitted with Automatic Chuck and screw bar feed. It is also equipped with chasing attachment for cutting from 4 to 32 threads per inch. This attachment is extra and furnished only when required.

This type machine will accommodate round bar stock up to 2" on the No. 5R machine, and up to 2½" round stock on the No. 6R machine.

All of the most important features necessary to maintain accuracy and speed at low cost are incorporated in this design which includes:

Hardened steel vees on bed.
Hardened steel ram slide bearings.
Triple roller spindle bearings.
Twin nut back lash eliminator on cross screw.
Non-overhanging headstock.
Side carriage apron taper gibed to front bearing on bed.
Independent feed ranges for either apron.

These are only a few of the many features.

For further details, or if you have any problems on bar or chucking work, feel free to contact us.

...The ACME MACHINE TOOL CO.
...CINCINNATI 32, OHIO.

New! STANDARD

COMPARATOR

DIAL SNAP GAGE

PATENT APPLIED FOR

Lighter weight...Easy to handle

ACCURATE TO .00002"

Comparator accuracy is brought right to the machine — in an instrument as light in weight as the ordinary snap gage. Easy to handle and easy to operate. No special skill needed. It can improve your inspection as well as your production.

6 Important Superiorities

Spherically surfaced upper anvil with flat lower anvil facilitates setting without danger of out-of-parrallelism. Also available with flat-shaped anvils for checking close to shoulders.

Upper anvil of wear-resistant cemented carbide; lower anvil (flat-lapped serrated surface) tipped with cemented carbide. Chips and dirt readily clear from this surface.

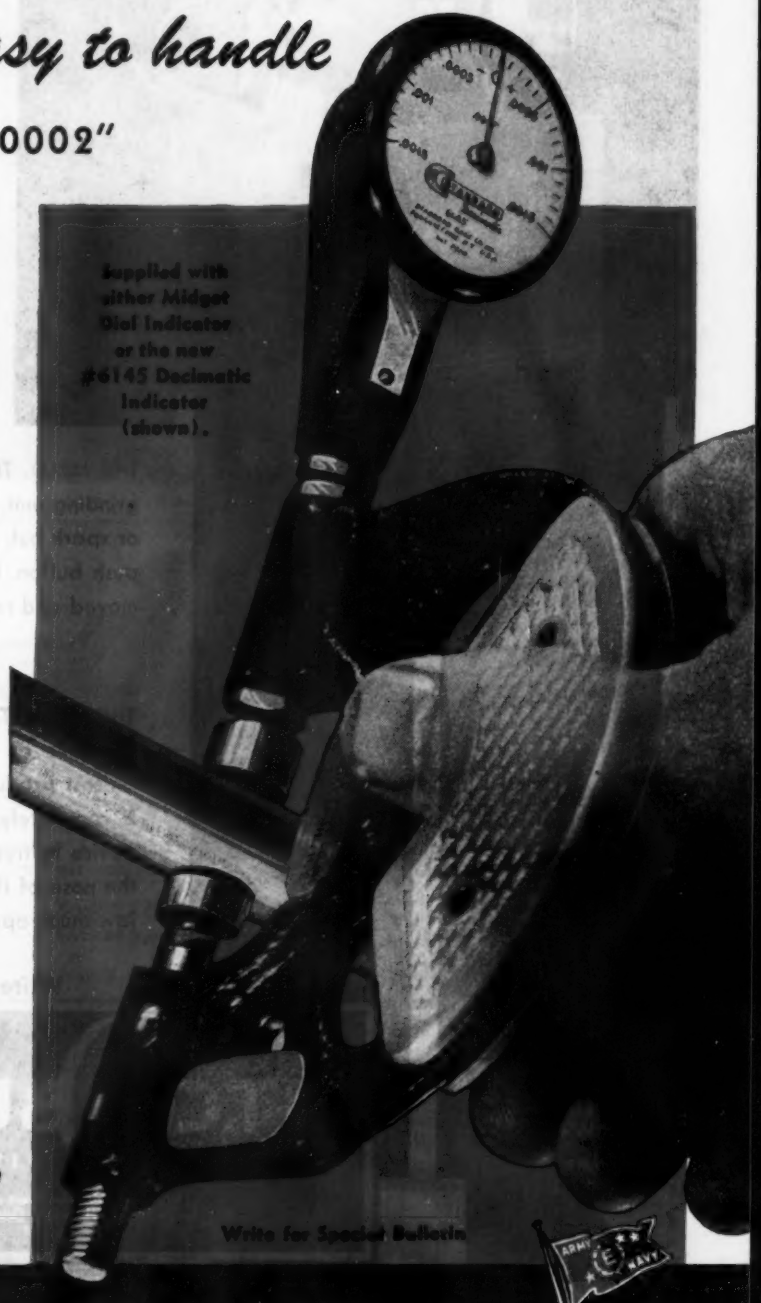
STANDARD Shockproof dial indicators furnished with these gages are an important factor in their *superior* accuracy.

Thermal grip insulated from gage body by air space. Heat of operator's hand has little effect on gage setting, even when used over long periods.

Dial indicator may be faced in any direction to permit reading from the most convenient angle.

Indicator graduated in .0001". Dependable readings can be made to .00002".

Eight sizes, each with a range of 1", cover range of 0" to 8". First three sizes can be used in bench stand for bench inspections. Sizes above 8" to order.



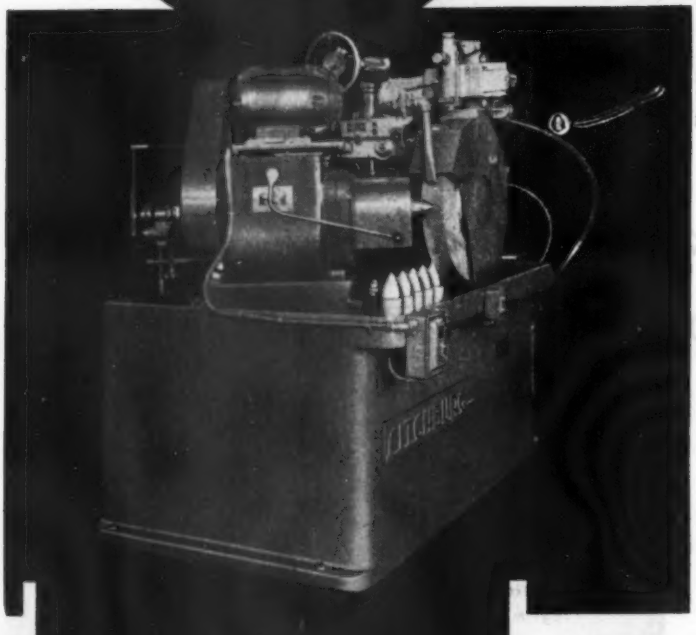
Supplied with either Midget Dial Indicator or the new #6145 Decimatic Indicator (shown).

Write for Special Bulletin

ARMY NAVY

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

Use THE FITCHBURG BOWGAGE HEAD TO GRIND IT *Cheaper, faster, better*



Just as multiple tooling and combined cuts increased production profits of machined work in mass production, the Fitchburg method of precision grinding cuts additional cost factors from every piece, saves on production and equipment.

Designed on an entirely new principle of precision grinding, the Fitchburg head is a completely self-contained and independent grinding unit. It may be installed singly or in multiples to operate simultaneously or consecutively in mass production. It also may be installed to modernize any equipment.

Get the facts — you will instantly make a favorable comparison between Fitchburg Automatic Precision grinding and any other method. Install a Fitchburg now, and use your "Head" to cut costs and speed production. Send your blueprints for our engineers' recommendations — there's no obligation.

THE HEAD. *The Bowgage Head* is a completely independent precision grinding unit. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position — all started by one push button. It is precise to .0002", minimizing spoilage. It can be removed and remounted for other work, if operations are changed.

THE BODY. *This Fitchburg Single-Head Ojive Grinder,* designed to grind the ojive of the 75 MM armor piercing shell, is typical of Fitchburg cut-cost production. The wheelhead, carrying a 24" x 3½" face wheel, is completely automatic. It is mounted with a hydraulic form trueing device to true the face of the grinding wheel at the proper radius for the nose of the shell. The workhead is equipped with a parallel-motion jaw-chuck, operated by a hydraulic cylinder at the back of the workhead.

Write Today for Catalog—Sent Free Upon Request

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

NOT ONE CENT FOR REPAIR

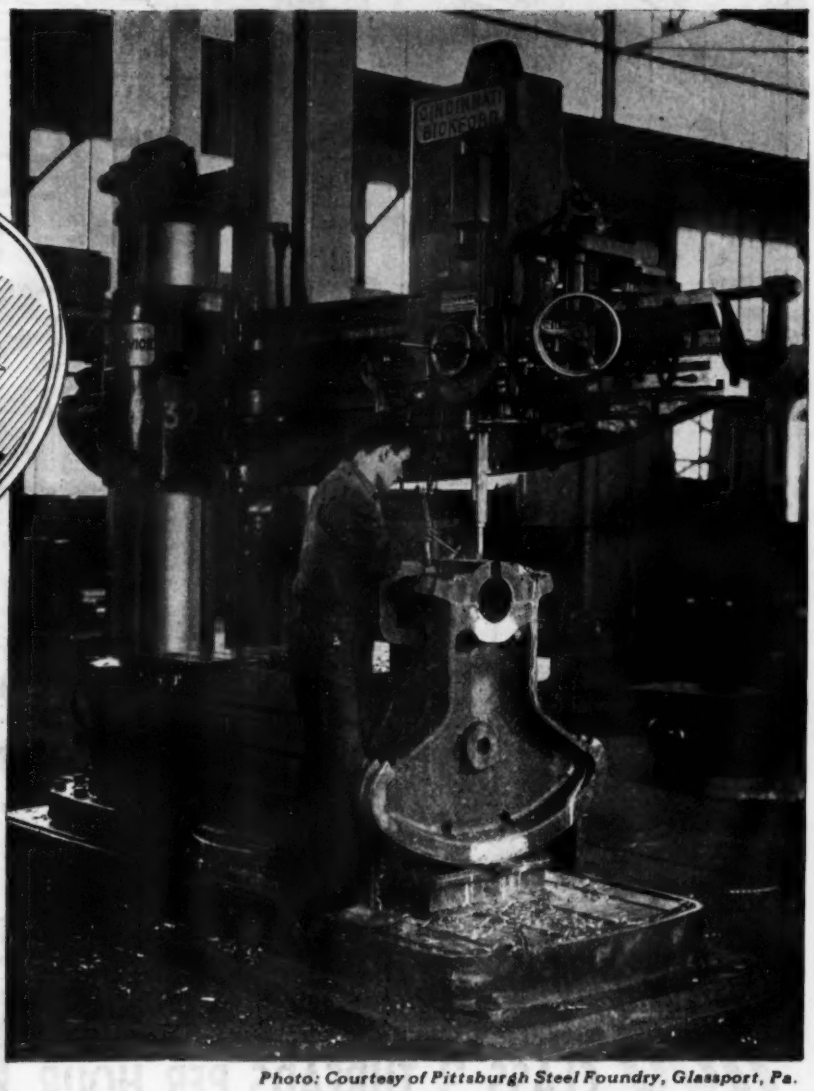


Photo: Courtesy of Pittsburgh Steel Foundry, Glassport, Pa.

"In constant operation twenty-four hours a day for one year and three months without one cent for repair or maintenance." This performance record at The Pittsburgh Steel Foundry, Glassport, Pennsylvania, indicates the correct design and fine workmanship found in Cincinnati Bickford SUPER SERVICE Radial Drills. Moreover, at this plant, due to the simplicity of operation and ease of control of the SUPER SERVICE Radial, no skilled operators were required.

Write for detailed Bulletin R-24A

See our condensed catalog in Sweet's File

The unusual depth and length of bearings found in the Cincinnati Bickford Arm give maximum rigidity. The arm is of triple box-section—for greatest resistance to deflection and torsion.

Equal Efficiency of Every Unit Makes the Balanced Machine.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

1100 CLASS 3 THREADS PER HOUR IN TOOL STEEL!

THIS Warner & Swasey No. 10 Precision Tapping and Threading Machine *automatically* taps 5-40 N.C. Class 3 threads in tool steel parts at the rate of 22 holes per minute—1100 in a 50-minute hour!

This work is handled by a special air-operated revolving fixture designed by Warner & Swasey to speed production on a vital job at an East Coast Naval Arsenal. The operator's only part in the tapping cycle is to load and unload the pieces.

A solenoid air valve synchronized with the upper and lower limit switches of the machine tapping stroke indexes the fixture after each operation. The fixture can handle other jobs of a similar type by using additional dial feed plates.

Only the absolute depth control and the new, positive lead screw tapping principle found on Warner & Swasey Precision Tapping and Threading Machines make possible this accurate, rapid-fire work in S.A.E. 52100 tool steel.

If you are interested in greater production, for lower tap costs and lower scrap losses in Class 3, 4, and 5 fits, ask your Warner & Swasey representative about this new principle. In many plants these new machines pay for themselves in tap life alone!

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

WARNER & SWASEY Machine Tools *Cleveland*

TURRET LATHES, SADDLE AND RAM TYPES · CHUCKING AND BAR TOOLS
PRECISION TAPPING AND THREADING MACHINES

AUG 20 1945

RESEARCH LABORATORY
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How Not To Develop Foreign Trade

WASHINGTON bureaucracy sometimes resorts to devious, mysterious and bewildering ways of doing things. Never has it been more inept than in the Foreign Economic Administration's handling of requests for machine tools and other production equipment for France and Belgium.

Both France and Belgium are in desperate need of rehabilitation if famine, unemployment and the deleterious effects of the war are to be overcome. The transportation system in particular must be restored and manufacture of essential goods resumed.

Plant equipment, especially machine tools, is sorely required. The more speedily tools can be obtained, the sooner will the two countries be on their economic feet again.

It is to our national interest, now and later, to see that France and Belgium get what they must have. Economic stability will bring with it employment, the ability to produce and transport goods, and a better chance that law and order will prevail.

Neither country is seeking charity. They will buy American tools on the basis of twenty percent cash and long-term payments for the rest.

Take the case of France. She originally intended to purchase $100,000,000 of U.S. machine tools on a 30-year payment plan, with one-fifth down. She was rebuffed for weeks in attempts to secure effective priorities.

She finally placed some thirty-two million dollars worth of orders, but since the Russian cancellation muddle occurred, the orders have been held up. Her officials were put in the position of not knowing how many tools they were to get or when deliveries would be made.

The experience of the Belgians isn't much different from that of the French. FEA has kept them at sea and for weeks they have despaired of getting anywhere. They haven't known where they stood.

Meanwhile the French, discouraged by the treatment accorded them, placed with the British a considerable percentage of the tools that they intended to buy here. As a result their purchases of U.S. machines will be appreciably smaller than the original figure.

More than aid to France and Belgium at a critical time and more than the loss of considerable business to our machine tool industry is involved in the current situation.

We Americans have repeatedly voiced our purpose of trying to develop for our industries a substantial foreign trade after the war. The first principle of any successful business is to create and foster good will among its customers. Yet, thanks to FEA, in our contacts with potential machine tool customers abroad, we reveal a "don't-give-a-damn" attitude.

The least to be expected of FEA is that it be frank and decisive in its dealings with France and Belgium. The recent dilly-dallying tactics should be abandoned. Consideration should be given our future trade relations with these two allies, instead of driving them deliberately into London's hands.

So far as we can learn, only minor FEA officials are responsible for this mess. Surely the higher-ups would not have displayed such stupidity.

If we are to be saddled with FEA as the determinant in building up our foreign trade in such key industries as machine tools, and if the French and Belgian cases are typical of what will happen in other cases, heaven help our postwar export business. We might as well write it off our books now.

Burnham Finney

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● This Morris high production machine was designed to meet the particular requirements of the job. The machine performs several operations on each piece without resetting.

It has a 3 H. P. vertical hydraulic feed with 8 station automatic indexing table—two side milling heads with rack feed—also an additional unit for chamfering end of half piston. Permanent bushing plate and milling heads are supported on the platen.

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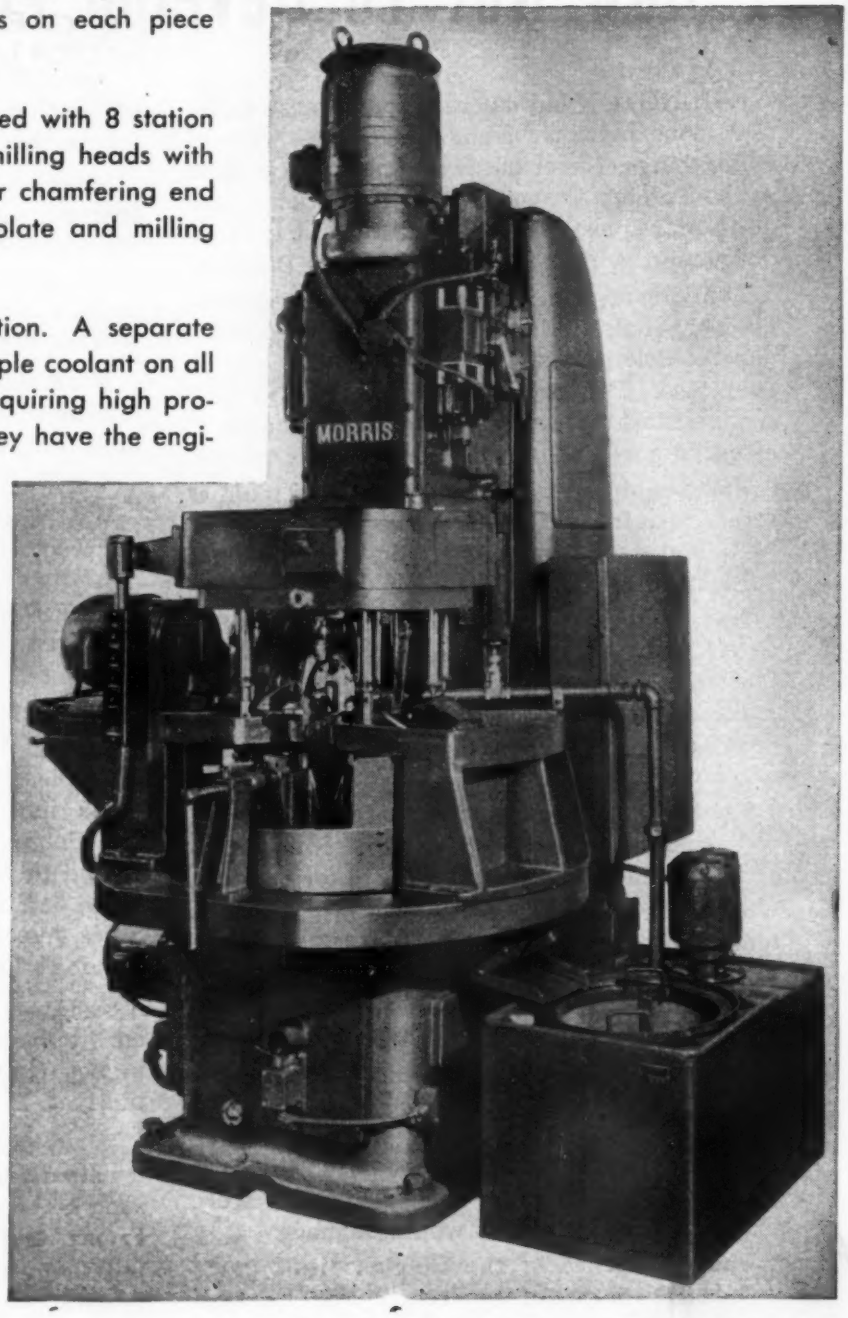

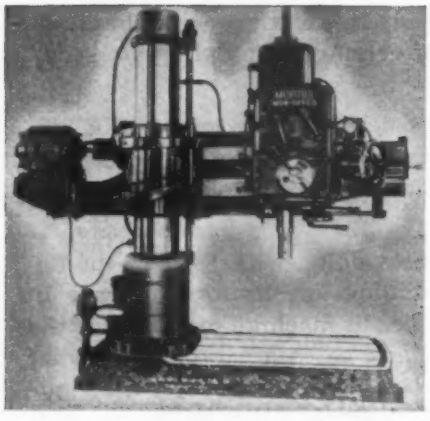

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The MORRIS Machine Tool Co.
CINCINNATI 3, OHIO

Negative Rake Turning Tools Improve Roughing Cuts in Steel

BY CARROLL EDGAR, DEVELOPMENT ENGINEER, CARBOLOY COMPANY

Carbide-tipped turning tools having negative side and back rake provide longer tool life between grinds. Negative rake finishing, facing and boring are being applied more widely

AN INEVITABLE sequel to the successful use of negative rakes on carbide milling cutters is the current progress in turning steel with negative rake carbide-tipped tools. While experience in this technique has largely been confined to rough turning of scaly or eccentric steel pieces, broader application is indicated by the profitable employment of negative rakes in finish turning steel, especially in interrupted cuts. Tools with negative rakes are also being used to a limited extent for both facing and boring rough, scaly and eccentric workpieces.

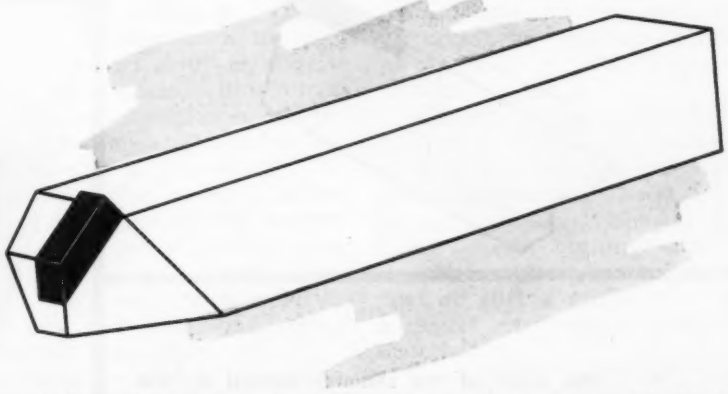
Today, virtually all artillery shell manufacturers are using negative rake turning tools for roughing cuts. The tendency of the negative rake to protect the cutting edge against chipping has resulted in a longer tool life between grinds. This is especially true where the work is eccentric, scaly and involves interrupted cuts. Where these conditions are not encountered negative rakes generally possess little if any advantage over positive rake angles for steel turning.

A negative back rake on a carbide tool protects the cutting edge by causing any irregularities on the surface of the workpiece to strike the tool back of the nose rather than on the nose, which is the weakest part. A negative side rake tends to throw the chip away from the cutting edge and thus prevent chipping of the carbide blank in a longitudinal direction.

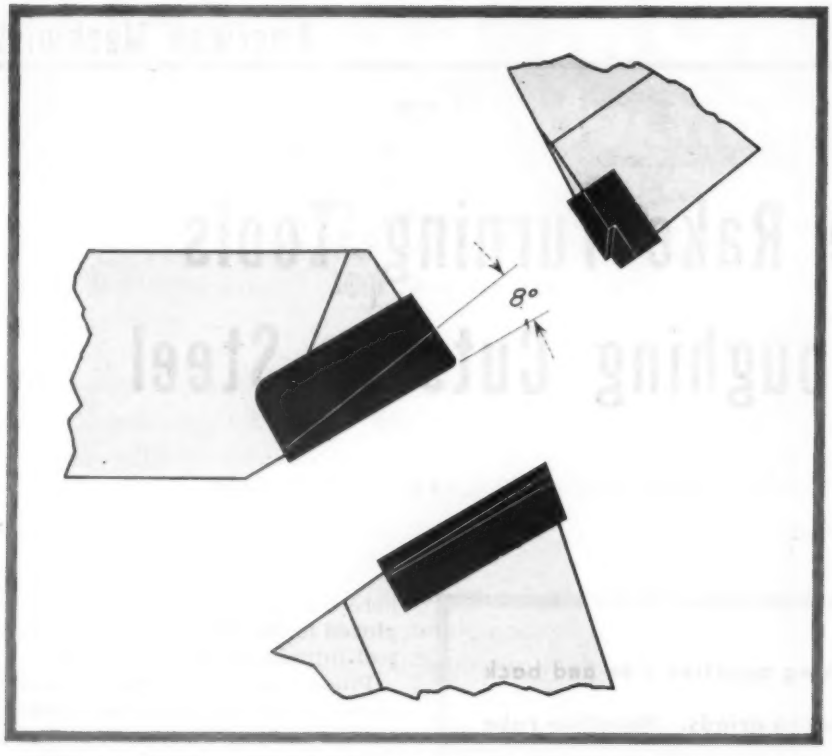
For the rough turning of steel forgings a carbide tool having a negative back rake of 5 deg. and a negative side rake of 5 deg. have been found to give satisfactory results. In most instances these angles are confined to the chip breaker rather than to the whole blank. It will be noted that the rake angles here are not as great as those employed in the commercial shear-type tool introduced some time ago.

Production runs have clearly shown that negative rake carbide tools used in rough turning will give even longer operation between grinds if the cutting edge and nose radius are honed at a 45-deg. angle. The width of the chamfer thus formed should not be more than 0.005 in. or 0.010 in. for best results. Honing in this manner removes any ragged edges that the cutting edge may retain from regrinding. It also protects the cutting edge against the sawing action of any scale that may be present. It is impossible, of course, to entirely eliminate this sawing action since experience has shown that steel scale is abrasive to the point of having a true grinding action on the cutting edges of turning tools.

The nose radius on a negative rake carbide turning tool should be of



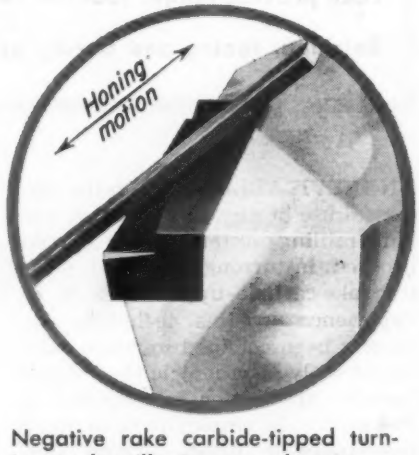
Interrupted roughing cuts on large diameter work are taken with this type of carbide-tipped turning tool. Impact following an interruption in the cutting is minimized by gradual entry of the tool into the cut since with a negative back rake the initial load is taken back of the tool nose



In practice the negative back and side rake angles are confined to the chip breaker of the turning tool rather than to the entire blank

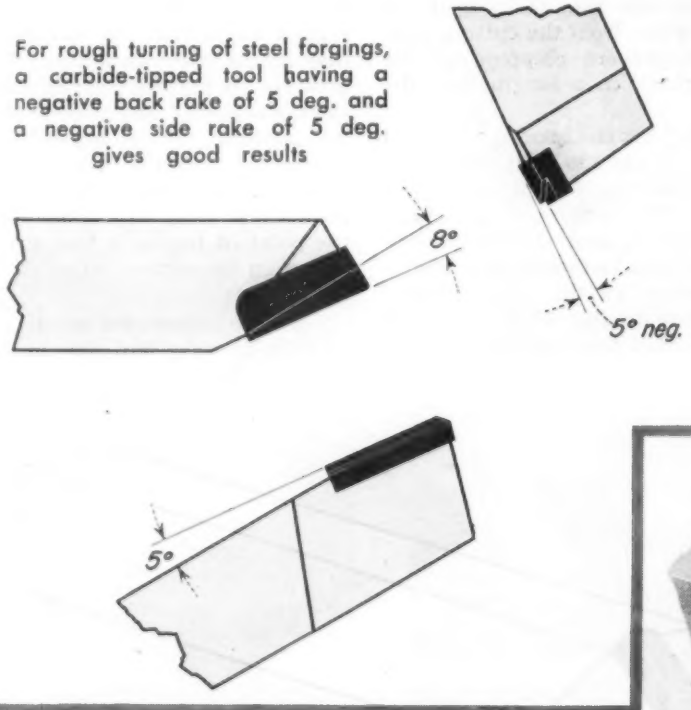
the same proportions as a conventional positive rake tool. If the nose radius is too large, the tool will develop a chatter—if it is too small then the tool will break down. Side and front relief angles of 5 to 7 deg. are ground on negative rake turning tools and represent conventional relief angles.

The nose of the negative rake tool should be set on or slightly above the center line of the workpiece. It has been found preferable, wherever possible, to use a side cutting edge angle of between 10 and 30 deg. on the turning tool. Such an angle eases the tool into the cut and out of the work at the end of a cut. On the other hand a tool with a zero side cutting edge angle jumps out of the cut and causes a condition which can easily lead to tool breakage. Another advantage of the tool with a side cutting edge angle, as compared to one with a zero side



Negative rake carbide-tipped turning tools will give even longer operation between grinds if the cutting edge and nose radius are honed at a 45-deg. angle

For rough turning of steel forgings, a carbide-tipped tool having a negative back rake of 5 deg. and a negative side rake of 5 deg. gives good results



The width of the chamfer formed by the honing operation should not exceed 0.005 in. or 0.010 in. for best results. Honing in this manner removes any ragged cutting edges that may be retained from regrinding

cutting edge angle, is that the chip load per unit of length is less. Speeds and feeds for negative rake turning tools are usually the same as those recommended for turning steels with positive rake tools.

Negative rake turning of steel generates considerably more heat in the chip than conventional turning does. Some of this heat flows into the tool and consequently a coolant is more often needed than when machining with positive rakes. When using coolants on a negative rake turning job a generous flow of the fluid should be directed either from the bottom or from one side of the tool and in such a manner that the chip will not act as an umbrella to keep the coolant away from the nose of the tool.

Although negative rake turning of steel requires 10 to 15 percent more power than does conventional turning, no power difficulty will be experienced with any machine tool suitable for use with carbide tools.

For finish turning of steel involving interrupted cuts, the edge of the turning tool should be dubbed off a little beyond the depth of cut

In using negative rake tools for finish turning of steel, in interrupted cuts, the edge of the tool should be dubbed off a little beyond the depth of cut to be taken. This type of tool will be found to give somewhat increased tool life where heavy chips are not formed, as the negative rakes apparently protect the cutting edge against the shock loads caused by hard spots in the steel.

In attempting facing cuts with negative rakes, a facing tool ground so as to have a zero back rake and a negative side rake of between 5 and 10 deg. has been found to work well. Increasing field experience with facing and boring tools is expected to uncover valuable applications of negative rakes to those operations.

Control of Magnesium Fires

MUCH has been said, and most often erroneously, about the danger of fire when processing magnesium. Before the war, magnesium fires were practically unknown, except as the result of explosions in powder grinding plants, because the cost of metal limited its use. But in the past three years, approximately one-half billion dollars has been invested in magnesium production facilities, mass production has reduced the unit cost to that of aluminum or less. So over the next decade, producers and fabricators of magnesium look for a considerable expansion in application of the light metal.

If in the future, magnesium is produced, fabricated, stored and used in practically every community, the fire hazard will be tremendous if the material is as inflammable as some have said. What do independent authorities have to say? At a conference of fire-department instructors, Lt. Harry Wolf of the Chicago Fire Department summed up the situation as follows:

In a basic study of fires involving magnesium or its alloys in foundries, machine shops and warehouses, it appears that the matter of greatest importance is minimizing the damage to structures, equipment and materials other than magnesium. The extinguishment of burning magnesium is important but secondary to protection of other property.

Where quantities of magnesium are actually burning in this type of fire, all factors should be determined in order to form an effective fire-fighting plan. Mangesium in solid masses, ingots and castings have been successfully attacked with a number of hose streams having maximum operating pressures. Stiff water streams on burning masses of the metal produce spectacular flareups and puggs. Final extinguishment is accomplished when the volume of water under pressure cools the burning mass to a point below its combustion temperature.

If chips, shavings or dust are involved, a solid stream may produce serious explosive results. The metal particles are easily heated to ignition temperature, and a solid stream tends to spread a flash fire, causing explosive mixtures when the particles are mixed with air. Water spray in large volume will minimize the probability of explosion, cool the surrounding combustibles and quicken the burning of magnesium.

A graphite-base powder, known as G 1, developed by the magnesium industry, seems to accomplish extinguishment of small fires quicker than any other material, even when used by persons lacking fire-fighting experience.

Magnesium in solid form requires a much longer time to ignite than turnings or other fines. Fires are not easily started in storage areas of solid mass metal, but locations producing finely divided waste metal are potential fire breeding spots. Normal good housekeeping practices require frequent removal of chips and grindings from all parts of the building. Metallic fines should be removed from the premises in closed non-combustible containers.

From experiments conducted by the Chicago Fire Department Drill School, this information was developed:

Although chips and grindings will burn more rapidly than solid metal, both require considerable time for a fire to gain headway such that destruction of the premises is threatened, except where fine dust is permitted to settle on structural supports, ledges and floor areas, thereby setting up conditions conducive to explosions or rapid transmission of heat and fire.

Magnesium fires in their incipient stages or before the combustible parts of the premises are involved can be approached closely for surveying the extinguishment procedure, because burning magnesium does not produce dangerous fumes, heat or stifling smoke to as great a degree as ordinary combustible materials.

An efficient sprinkler system should control burning magnesium, cool the metal not involved and protect the combustible sections of the premises.

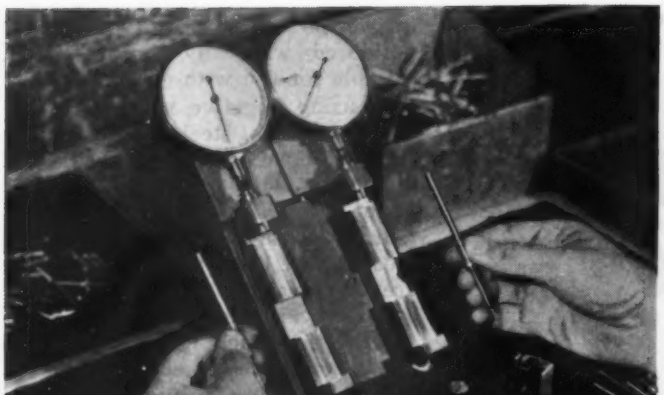


Fig. 1—Arming stem assemblies for a bomb fuze are inspected two at a time in this bench unit for diameter and location of a brass sleeve on the steel stem. Duplicate gages make possible the use of two hands

Fig. 2—Brass heads for a percussion fuze easily are checked on plug gages held in a board mounted in a convenient position on the inspection bench. Each gage is provided in duplicate for two-hand inspection

Special Double Gage Set-Up Speeds Inspection of Small Parts

Inspectors can use both hands for simultaneous checking of two pieces. Gage combinations likewise speed inspection work

INSPECTION of large quantities of small parts that must be made to close tolerances and which require 100 percent inspection, usually can be speeded materially through the use of double multiple-position gages that permit the operator to check two pieces at once. Gaging units of this type have been developed at the plant of the Carter Carburetor Corporation for checking carburetor parts and parts for various types of percussion and mechanical time delay fuzes.

Wherever possible, the gaging elements used in these assemblies have lands or guides to permit easy entry of the work onto the gaging points or between gaging elements. Usually, the work pieces are delivered to bench inspection stations in pans or racks. Where precise surfaces must be protected against damage, the inspector places the inspected part in racks at one side of the gage assemblies. For other parts, it often is possible to provide chutes through the bench surface for drop delivery of inspected parts to tote pans placed under the bench. Some gages are arranged so that good parts are placed to one side of the bench and a chute is provided beside each gage on the assembly so that rejected parts can be sorted automatically according to the reason for rejection. Where production quantities justify the extra cost, a mechanical counter is suspended under the bench to check the number of pieces dropped through a chute. In such cases, a paddle on the end of the counter arm projects into the chute so that a piece falling through the chute trips the paddle to register another number on the counter.

In Fig. 1 is shown a double multiple-position gage assembly for

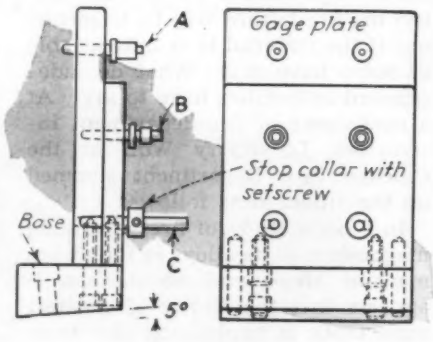


Fig. 3—This multiple plug gage assembly is used for checking the size and concentricity of a counterbored hole in a small part. It is similar to the gage unit shown in Fig. 2

checking the diameter of a brass sleeve on a bomb fuze arming stem assembly, checking the diameter of the steel stem and the location of the sleeve on the stem. Two multiple-position snap gages are set vertically on the top of the work bench so that the operator, holding an assembly in each hand, can check the sleeve and stem diameters on two parts simultaneously. In back of the snap gage units are two dial indicator gages for checking the distance from the head of the sleeve to the end of the stem.

A pile of parts to be inspected is placed to each side of the gaging units and the operator, in a natural sequence of motions, selects a part from these piles with each hand and progressively checks the two diameters in the snap gages. Then, moving her hands forward, she inserts the pieces in the indicator gage units. If both parts are within the required tolerances she again moves her hands forward to place the parts in small boxes at the back of the bench on either side of the gage assembly. If either or both parts do not come within the required tolerances, the hand holding that part is moved to the side, instead of forward, to deposit the piece rejected in other trays or boxes placed at either side of the gage assembly.

A similar set-up for checking counterbored holes in the back of a brass head for a percussion fuze is shown in Fig. 2. Here, the fuze heads are delivered to the inspection bench in racks which are placed to the inspector's left. Her sequence of operations is to select a work piece with each hand from the rack, and successively place each part over the two duplicate lines of three plug gages set in line on a vertical board in front of the inspector. Accepted parts are moved from the gage unit to a rack at the inspector's right.

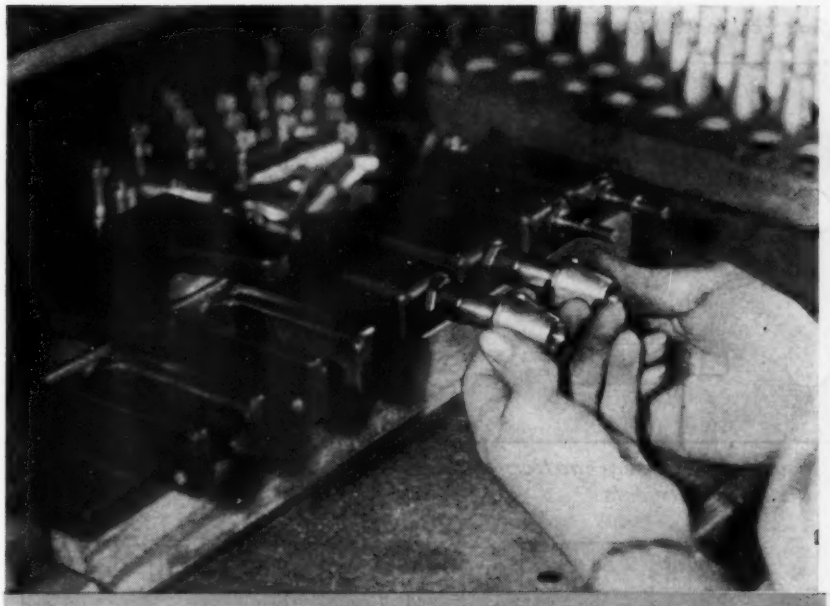


Fig. 4—The second inspection operation for checking fuze heads is placed on the bench to the right of the set-up shown in Fig. 2. Duplicate gages are provided for two-hand inspection

Basic design principles involved in the gage unit shown in Fig. 2 are indicated in Fig. 3. It will be noted that there are two each of three different plug gage elements, *A*, *B*, and *C*, set into a gage board designed for mounting on the inspection bench. In the sequence of inspection operations, the part first is placed over gage *A*, then the hand holding the part is dropped and the part is placed over gage *B*. Finally, the hand is dropped again and the piece is inserted over the gage *C*. By having two vertical rows of gages, the operator can hold a part in each hand and thus inspect two simultaneously. The gage board is bolted to a base unit so that it tilts forward 5 deg. when mounted on the inspection bench. This facilitates entry of the part on the plug gage.

By having standard gage boards, and inserting gage bodies in tapered holes in the board, it is possible to remove gaging elements for repair or replacement and the same board later can be used with another set of plug gages for checking an entirely different part. The base of this assembly is made from cast iron, the plate is made of cold-rolled steel, while the six part gages are made from tool steel and are hardened and ground all over.

Time is saved in the inspection of the fuze heads shown in Fig. 2 by arranging the inspection bench so that the second inspection operation is to the right of the first operation and the second inspector, as shown in Fig. 4, then can secure parts from the rack on which the first inspector has placed finished parts. The second inspector uses a series of three pairs of duplicate gages to check the height of the head and two internal diameters. Parts accepted by this inspector are placed in a rack to her right. The duplication of each gage to make possible two-hand inspection doubles the quantity of parts which can be checked in a given time. It also makes possible the development of natural sequence of operations which reduces inspection fatigue materially. Motion-analysis

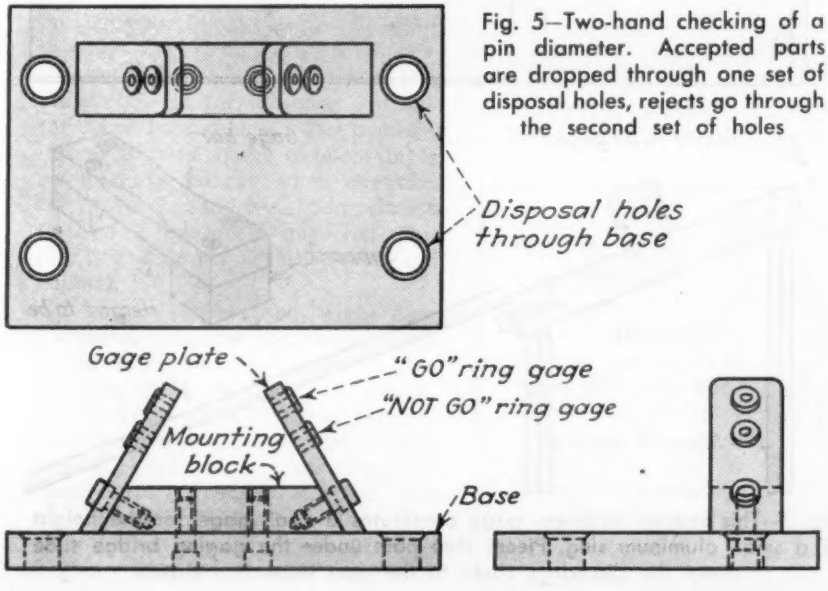


Fig. 5—Two-hand checking of a pin diameter. Accepted parts are dropped through one set of disposal holes, rejects go through the second set of holes

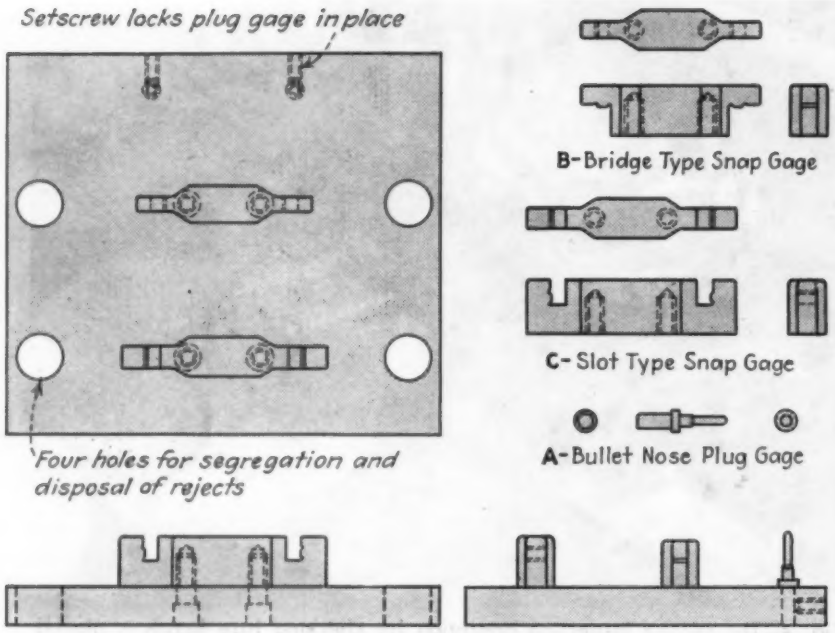

Setscrew locks plug gage in place
Four holes for segregation and disposal of rejects
B-Bridge Type Snap Gage
C-Slot Type Snap Gage
A-Bullet Nose Plug Gage

Fig. 6—Inside and outside diameters and length of a steel bushing are inspected in this gaging unit by the two-hand method. All parts are made of tool steel, hardened to 63 Rockwell C and ground and lapped

of the gaging operations to be performed enables the gage designer to set up the gages for such a sequence of operations.

Figs. 5 and 6 show several methods by which ring gages, plug gages, and snap gages can be combined on gage boards for efficient two-hand inspection of smal parts. Also indicated is the method in which holes can be placed in the baseplate of the gaging fixture for disposal of rejects or accepted pieces. The assembly shown in Fig. 5 is a multiple ring gage in which each gage plate for right-hand or left-hand use has a "go" ring gage and a "not go" ring gage supported at an angle convenient for the inspector. Beside each gage plate there is a disposal hole through the baseplate for dropping accepted parts into chutes for delivery to a pan under the inspection bench. To the front of the baseplate are two additional disposal holes for dropping rejects through chutes into another pan. Usually, the baseplate and gage mounting plate for such assemblies are made from cold-rolled steel, while the ring, plug and snap gage elements are made from drill rod or tool steel.

Fig. 6 shows an inspection gage assembly which combines a plug gage, a bridge-type snap gage and a slot-type snap gage for inspecting a part by the two-hand method. This tool checks a 0.1205-0.1245 in. inside diameter, a 0.1955-0.1995 in. outside diameter and 0.371-0.379 in. length of a small bushing. The two-diameter bullet nose type plug gage shown at *A* has two diameters so that it serves as a go and not go plug gage for the inside diameter. The bridge-type snap gage shown at *B* has overhanging steps at each end so that the two parts can be checked at the same time for the length dimension. At *C* is shown in detail the slot-type snap gage unit for checking the outside diameter of the bushing. There are four 5/8 in. diameter holes in the baseplate for segregation and disposal of rejects. Accepted pieces are placed in boxes or on the bench in back of the gage assembly. Because the baseplate as well as the elements mounted on this plate are used for actual gaging operations, all of the parts of this assembly are made from tool steel hardened to a minimum of 63 Rockwell C. All surfaces are ground and lapped to size. Each of the snap gages has go and not-go steps as indicated. The advantage of the bridge-type snap gage is that the surface of the base plate extending beyond the area covered by the bridge section serves as a surface on which the parts can be placed before sliding them under the gaging extensions.

In Fig. 9 is illustrated a two-position gage for checking the compressed height of a fuze spring when loaded with a 190 grain standard weight. There are two vertical pins

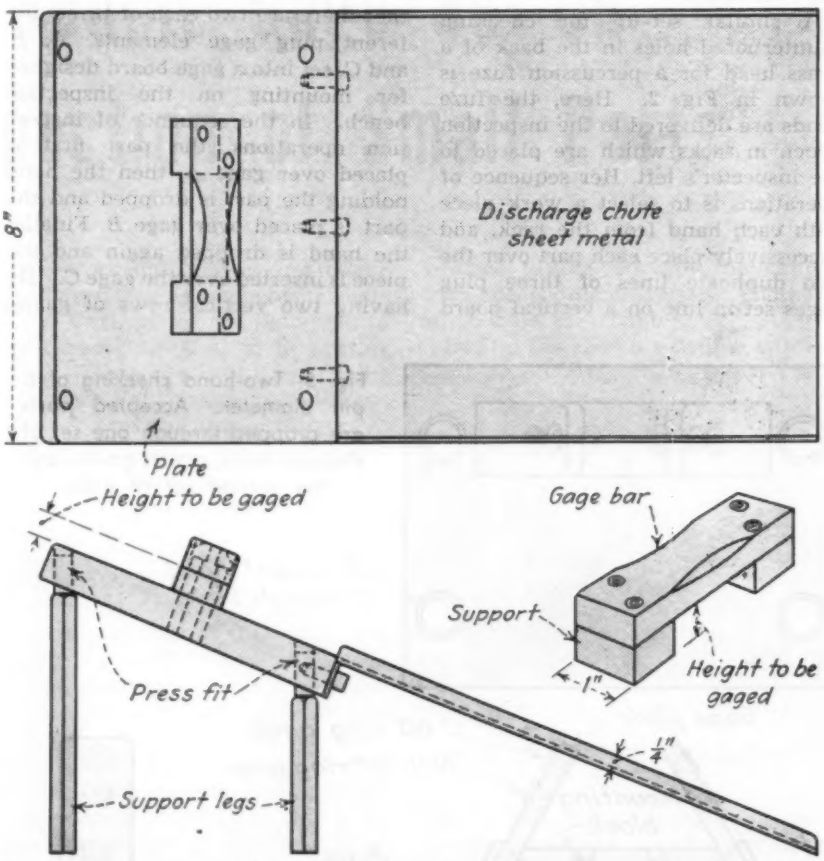


Fig. 7—This special thickness gage constitutes a "go" gage for the height of a small aluminum slug. Pieces that pass under the gaging bridge slide down the discharge chute to the next inspection station

on the baseplate and these are used alternately for checking springs. First, a spring and weight are dropped onto one of the gage rods, then, while the operator waits for the spring to come to rest, she drops a spring and weight on the second rod. By this time, the spring on the first rod is at rest and by looking in the mirror, she can determine whether the spring is compressed sufficiently to bring the top of the weight within an area marked by the width of a red line on the gage rod. If this red line does not show, the spring is too strong. If, however, the red line shows and any portion of the gage rod below the red line also shows above the weight, the spring is too weak.

Removal of the weight and spring, and replacement with another spring and weight is done while the spring

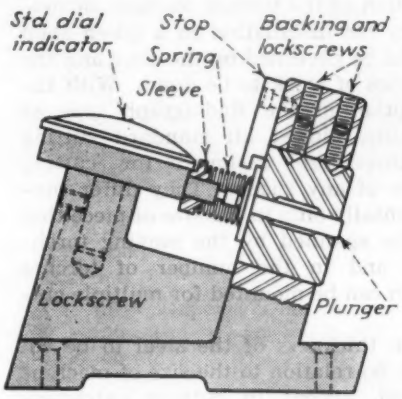


Fig. 8—Depth of a counterbored hole is checked within close limits with this special dial indicator gage. Two of these units are placed side by side on the inspection bench for two-hand checking procedure

on the second vertical pin is coming to rest. Two chutes are provided in the work bench beside this gaging unit. One is for accepted springs, the second for rejects. The use of a mirror in back of the gage assembly reduces eye fatigue when checking the position of the weight in relation to the red line on the gage rod. This line is a wide groove filled with red enamel.

A simple bridge-type height gage for mass checking aluminum slugs whose height must not exceed a given dimension is shown in Fig. 7. The baseplate and bridge of this assembly are made from hardened and ground steel while the discharge chute is made from sheet metal. The gaging parts are hardened and the gaging surfaces are ground and lapped. The baseplate is supported

Fig. 9—While the spring and weight on one pin are coming to rest for gaging the spring height, the inspector removes a checked spring from the second pin and replaces it with another spring to be checked. The mirror helps her see the relation of the weight with a red line on the gage pin

at a 25 deg. angle so that acceptable pieces will slide under the bridge and down the chute by their own weight. The inspector merely slides hands full of parts in front of the gage bridge, and moves away from the bridge parts which will not slide under.

A simple mount for ring gages which can be set up in pairs on an inspection bench for two-hand inspection of parts has spring-loaded plungers to help guide the parts into the ring gages and assists in easy withdrawal of the parts after gaging. The body and the plungers of this assembly are made from machine steel while the "go" and "not-go" gage rings are of tool steel, hardened, ground and lapped to size. These units can be set up vertically or mounted at any desired angle by placing an angle block under the angle iron support piece. Fig. 8 shows a simple indicator gage made up for checking the depth of a counterbored hole in a fuze part. The depth of this hole must be held between 0.038 and 0.041 in.

Fig. 10 shows a special small gage developed for checking orifice diameters of low speed carburetor jets. The gaging unit shown checks only the orifice diameter. The support is a 2-in. length of 1½-in. hexagonal cold-rolled steel rod. In this support is mounted a 7/16 in. diameter, 2¼ in. long horizontal steel gage bar drilled to take four 0.095 in. diameter gage pin holders. These holders are 1 in. long sections of 0.093 in. diameter brass tubing in which are inserted drill rod plug gage pins whose diameter is either the large or small diameter permitted in the jet. The two smaller pins, which constitute "go" gages, are mounted in the two inner positions, while the two larger pins or "not-go" plug gages are outermost.

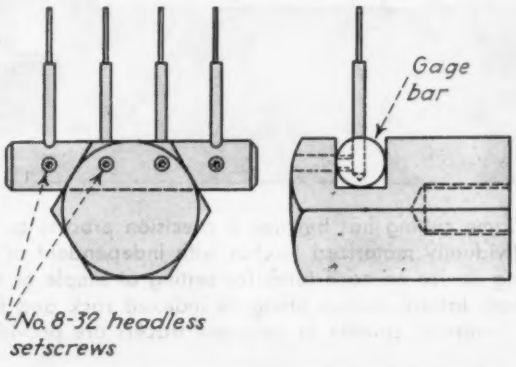
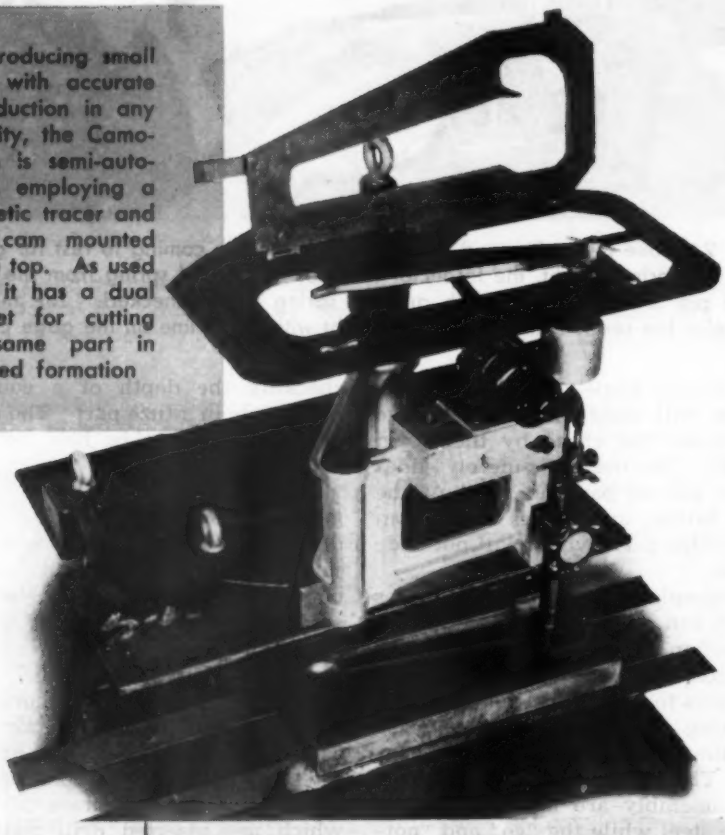


Fig. 10—Small "go" and "not go" plug gage pins in this unit check orifices of carburetor low-speed jet tubes with little effort on the part of the inspector. The gage holder rod can be set at any convenient angle

Oxyacetylene Machines Meet Varied Cutting Requirements

BY DR. G. V. SLOTTMAN, APPLIED ENGINEERING DEPARTMENT,
AIR REDUCTION SALES COMPANY

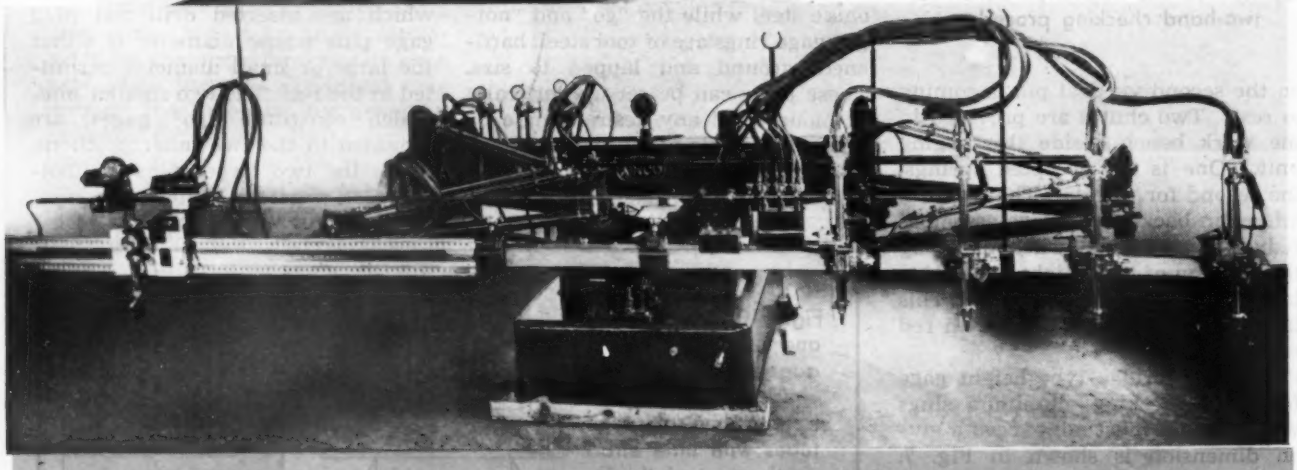


For producing small parts with accurate reproduction in any quantity, the Camograph is semi-automatic, employing a magnetic tracer and steel cam mounted at the top. As used here, it has a dual templet for cutting the same part in nested formation

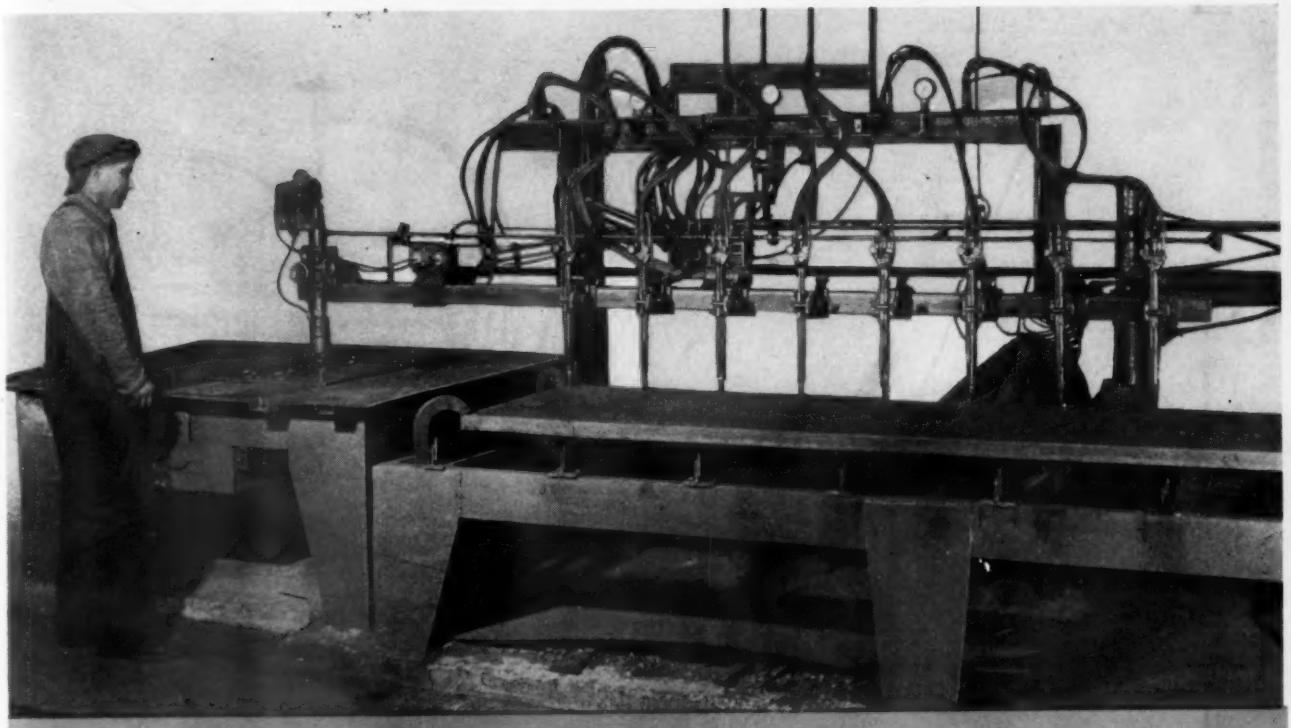
Different machines and auxiliary equipment are reviewed in this third installment in a series

SINCE OXYACETYLENE cutting of production quantities of parts is almost invariably performed by machine, the selection of the type of machine or machines for installation in a given shop should be governed by the sizes and the volumes of work to be done. With the exception of the Radiagraph type of machine, almost all standard cutting machines are designed for cutting pieces of any shape. They differ fundamentally only in the size of piece that can be spanned by the moving torch-arm, and in the number of torches which can be mounted for multiple cutting.

The thickness of the steel to be cut bears no relation to the size of machine needed, except in cutting extremely heavy steel. In the latter case heavy-duty torches and auxiliary apparatus are needed, and these may be mounted



Flame cutting has become a precision process as demonstrated by the special Travograph machine. It has individually motorized torches with independent or unified remote control for raising and lowering; vernier indexing device on each torch for setting at simple or compound angles; and a tracing head which is motorized for both lateral motion along its indexed rack and for following the contour of the templet. Interchangeable manual, spindle or magnetic tracers are provided, and a tachometer indicates the actual speed of cutting



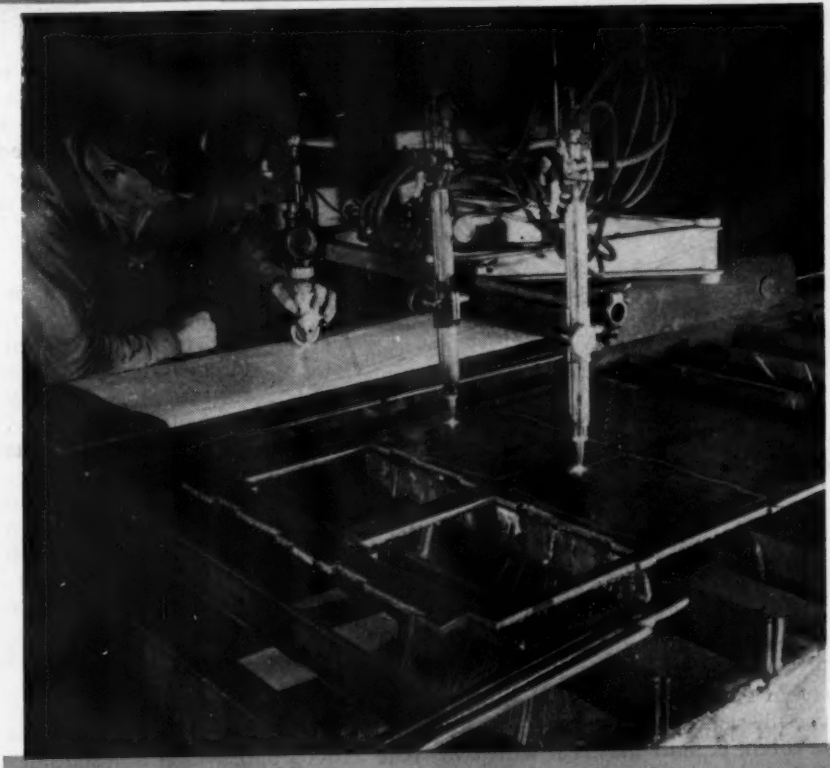
Quantity production of small and medium-sized parts by multiple torch cutting is best served by the Oxygraph which can carry ten torches simultaneously. Note the well designed, welded tracing and cutting tables. Cross members on worktable are Ts bolted to the frame with copper strips bolted to the Ts. Only the strips need replacement after a period of service to maintain a smooth support for the workpieces

on any machine heavy enough to carry them.

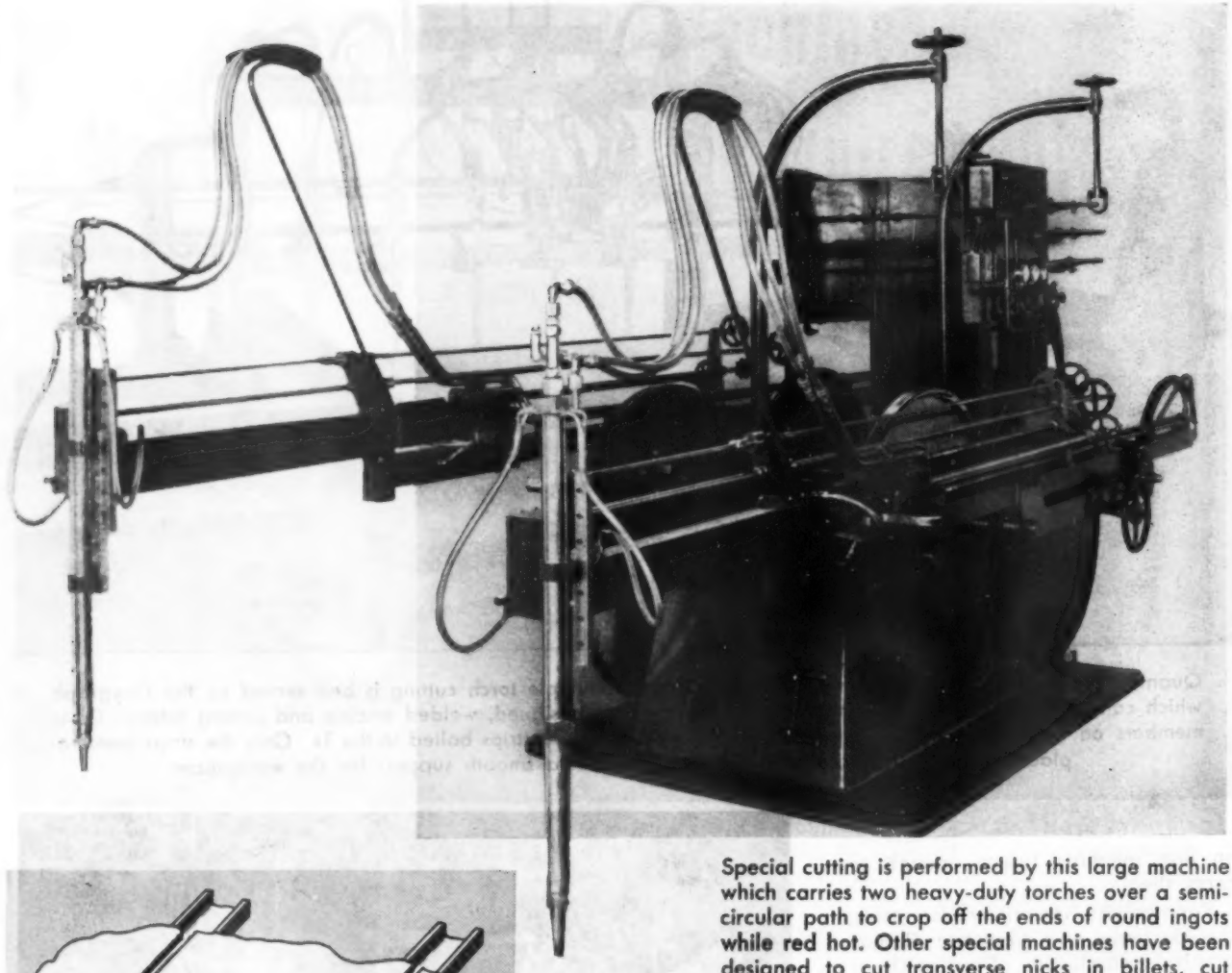
For straight-line and circle cutting the portable and versatile Radiagraph is employed. Used with or without adapting equipment, this portable machine serves for plate squaring, beveling and other methods of preparing plate edges for welding, stack cutting, flame machining, beam splitting and parallel cutting with two torches. It is essentially a prime mover, or simply a motorized torch, and as such it is highly adaptable in the hands of ingenious operators. Normally it travels at variable speed on a portable track, supplied in interlocking lengths for unlimited straight-line work. A radius rod and center point guide it in making circular cuts.

The smallest type of universal shape-cutting machine is represented by the Camograph. Designed for cutting small parts in unlimited quantities, this machine carries only one torch. It is guided automatically by a magnetized roller which is driven by motor at variable speed around the contour of a steel cam mounted directly above the torch. Portability and a high degree of accuracy are characteristic of this machine. It can be set directly upon the workpiece or upon a bench.

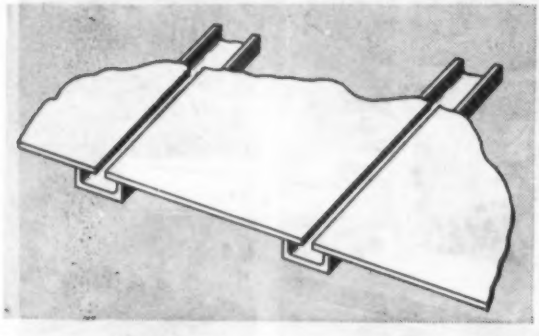
A two-torch cutting machine of



The two-torch Planograph is a medium-sized machine for cutting irregular shapes. A manual tracer is shown following the outlines of a drawing on paper. Such a machine is suited to small shops where production of flame-cut parts will not be large enough to warrant purchase of a large machine. Note design of the worktable with replaceable strips in bracket supports. The bars are inverted when eroded, and are replaced when both edges are cut up



Special cutting is performed by this large machine which carries two heavy-duty torches over a semi-circular path to crop off the ends of round ingots while red hot. Other special machines have been designed to cut transverse nicks in billets, cut blooms as they roll from the mill, and to cut joint profiles in pipe



Templet table with slotted top is made by welding plate sections to channels. Steel templets may be readily fastened firmly in position with bolts riding in the slots

intermediate size has a pantograph-type carriage riding on tracks, spanning its own tracing table. Equipped interchangeably with manual, spindle, or magnetic tracing devices, it can cut any shape of piece within an over-all size of 2 by 6 ft. with a single torch, or half that size with two torches in simultaneous operation. This type of machine is best suited for cutting moderate to large quantities of identical parts of any shape and of any size falling within he range specified. Paper, plywood or steel templets can be used, with the appropriate tracing device, to cut single or stacked plates.

The Oxygraph type of machine is larger, carrying four to ten torches for multiple cutting in quantity production of parts. A stationary machine, its over-all range is irregular in shape, and size of part cut in multiple varies with the number of torches used. Separate tracing and cutting tables are required, and any of the three aforementioned types of templets and tracing devices can be used, according to the operator's needs.

The largest universal machine is the Travograph, which is essentially an Oxygraph mounted on rails to permit cutting over an unlimited range in length. The maximum width of pantograph arm motion is 12 ft. One to ten torches can be operated simultaneously, and depending upon the number the 12-ft. maximum range must be divided accordingly. These machines are used when large pieces, such as ship plating, locomotive side frames, or smaller parts, are to be cut.

In addition to the foregoing representative types of cutting machines, others of more limited range of application are also available from manufacturers. Special-purpose machines may also be made to adapt the movement of the torch or torches to the needs of a particular job. For example, an ingot cutting machine carries two torches in a semi-circular path in a vertical plane for cropping the ends of corrugated ingots.

In determining the number and types of machines best suited to meet the needs of a given shop, it is desirable to have some advance knowledge of the sizes of pieces which will be cut over an extended period of time, and the quantities of such pieces needed within any given time. By comparing these figures with the capacities of the different machines an intelligent decision can be made. It should be remembered that the larger machines can cut not only

large pieces but small ones as well, and in greater quantities than the smaller machines. Thus it is not necessary to equip a shop with both a large and a small machine simply because a wide range of sizes will be cut, if one large machine can handle the total production. Likewise it can conceivably be better economy to have two small machines than one large one, if small quantities of numerous different shapes will be cut, since the flexibility of set-up will be greater with the two machines than one larger unit.

The portable cutting machines can obviously be readily accommodated in any shop without need for planning the installation. All that is needed for these is electric power supply and either cylinder or pipeline supply of oxygen and acetylene, plus worktables for supporting the plate during cutting.

The installation of universal shape cutting machines requires, in addition to power and gas supplies, a stable machine foundation, tracing table, a well designed cutting table, and adequate materials handling equipment.

Taking these in order, the location of the machine and the nature of its foundation should be such that vibration or jarring will not be transmitted to the mechanism of the machine or its operating tables during cutting. Vibration can destroy the delicate balance of the floating torch supports, and shocks can have the same effect as well as cause irregular cuts or even loss of cut.

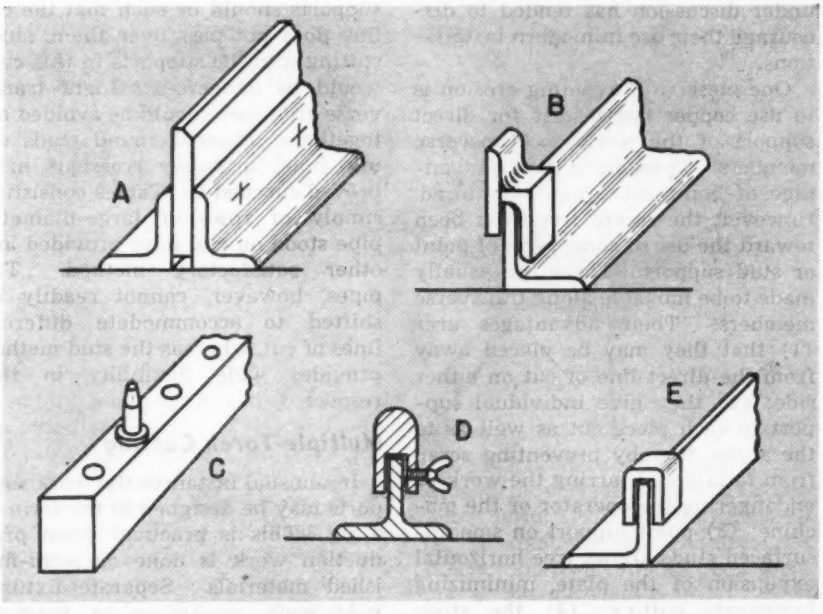
The tracing tables needed for the large machines may have either wooden or steel tops. All-steel construction is definitely preferable for durability, fire protection and flatness. Any design which assures stability is suitable, provided the length and breadth are adequate to accommodate the full range of movement of the tracing head. The design should, however, take into account the kinds of templates which will be used, and make some provision for fastening them to the table. Paper templets may be fastened to a steel table either by weights, battens or tape. Thumb tacks are employed on wooden table tops. When paper templets are used almost exclusively, a wooden table is best. Register marks are often made on large paper templets and at corresponding points on the table, as a check against changes in templet size due to atmospheric changes. One large fabricator has installed heaters beneath the tracing table to control such changes by keeping the temperature of the paper templet constant when in use to avoid cutting errors.

Wooden or steel templets can be fastened with C-clamps (in which case the table top should have sufficient overhang for the clamps to engage) or they may be bolted to transverse slots. Strongbacks or deep-jaw U-clamps are also frequently used. large steel templets will usually remain in position by their own weight and need no clamping.

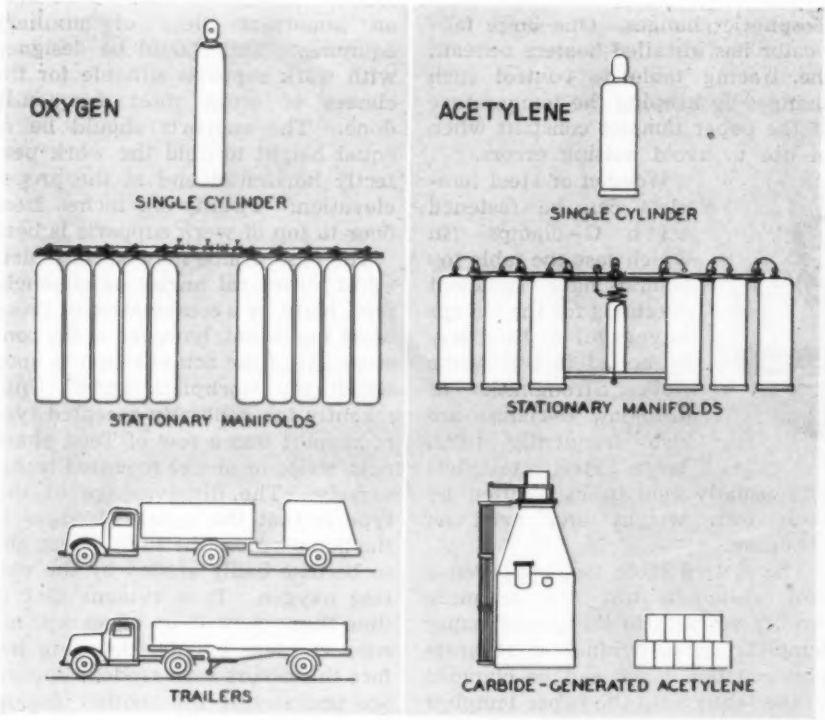
The slotted table top, and even a flat continuous top, can be more readily adapted to the use of paper templets by providing a separate plywood top which can be clamped to the table, with the paper templets tacked to this board. This technique also permits the board and templet to be readily shifted from one work position to the next in production operations involving multiple layouts of plate.

The cutting table or worktable is an important piece of auxiliary equipment, and should be designed with work supports suitable for the classes of work most frequently done. The supports should be of equal height to hold the work perfectly horizontal and at the proper elevation. Twenty-six inches from floor to top of work supports is best.

The basic frame may be constructed of structural angles or channels, pipe, plate, or a combination of these. More important, however, is the construction of the actual supports upon which the workpiece rests. Until recently the generally accepted type of support was a row of Tees, channels, strips or angles mounted transversely. The disadvantage of this type is that the upturned edges of the flanges cross the lines of cut, and so become badly eroded by the cutting oxygen. It is evident that in time these chewed-up edges will not support plate evenly, but long before this occurs such eroded supports are undesirable for another reason. Recent studies have shown the importance of freedom of movement of the plate during cutting to minimize distortion, and that work supports which impede such motion at any point promote dimensional inaccuracies in the finished work.



A few of the many types of plate supports for worktable tops. T's, angles, channels or strips may be used interchangeably with most of these. Single angles must be welded or bolted to table frames; T's or double angles need not be, and may be shifted to the most desirable position for each cutting job. (A) Chamfered copper bar insert, bolted between angles will not become eroded. (B) Movable supports cut and welded from angle stock; several of these are placed on each transverse member at points away from the line of cut. (C) Studs with welded collars set in holes in drilled bar; for heavy plate; studs are set inside and outside the lines of cut; small contact areas permit free plate motion. (D) Rounded studs set with wing screws; point contact gives minimum resistance to plate motion. (E) Clips at intervals on cross members



Methods of supply of oxygen and acetylene. The method used depends upon volumes needed at peak loads

Since plate edges can easily catch onto obstructions on jagged work supports, the need for frequent replacement of the type of support under discussion has tended to discourage their use in modern installations.

One method of avoiding erosion is to use copper bar inserts for direct support of the work on transverse members. These have the disadvantage of being more easily battered. However, the recent trend has been toward the use of some form of point or stud support. These are usually made to be movable along transverse members. Their advantages are: (1) that they may be placed away from the direct line of cut on either side; (2) they give individual support to each piece cut as well as to the scrap, thereby preventing scrap from falling and jarring the work or endangering the operator or the machine; (3) point support on smooth-surfaced studs allows free horizontal expansion of the plate, minimizing inaccurate cutting; (4) the studs may be readily replaced at little cost; (5) there is no possibility of slag bonding between work and support.

Large steel fabricating shops which employ worktables of extended length sometimes use disk-wheel supports consisting of a row of transverse shafts, each mounting four 10 or 12 in. disks. These possess most of the advantages cited above, and in addition they allow easier maneuvering of large plates since the shafts are free to rotate.

For cutting heavy material the supports should be such that the cut line does not pass over them, since cutting into the supports in this case would be dangerous. Light transverse crossbars should be avoided altogether. Tapered round studs set into holes in heavy crossbars have proved successful. Tables consisting simply of rows of large-diameter pipe stood on end have provided another satisfactory method. The pipes, however, cannot readily be shifted to accommodate different lines of cut, whereas the stud method provides wide flexibility in this respect.

Multiple-Torch Cutting

In unusual instances the work supports may be designed in the form of a jig. This is practical when production work is done on semi-finished materials. Separate fixtures hold each workpiece in position, permitting multiple-torch cutting. This method is often applied when pieces cut in multiple must be turned over for making a second multiple-torch cut in a different plane.

Production cutting operations require a constant supply of ample volumes of oxygen and acetylene gas. Depending upon the volumes needed, the gases may be supplied by (1) individual cylinders, (2) several cylinders connected by portable manifolds, (3) stationary cylinder manifolds, supplying gases through pipelines, or (4) acetylene generators and bulk supply of oxygen by means of trailer trucks, both operating through pipelines. The method selected should be governed not by average but by peak load requirements in the shop.

The selection of regulators, hose, torches and tips is also chiefly dependent upon the maximum gas volumes needed for the range of work to be done. The flow capacity of this equipment should be uniform throughout the entire system, since an undersize hose gland, small lead hose or constructed gas passage at any point nullifies the advantage of larger capacity in the balance of the system.

Careful consideration must be given to the location of the machine. According to whether raw or semi-finished materials are to be cut, the machine should be placed at a strategic point in the production scheme. Materials handling facilities should be adequate to bring work to the cutting table and remove finished work expeditiously to keep the work factor of the cutting machine high.

Compressed Air Spins Nuts On Long Threaded Bars

W. O. DOWNS,
THE BABCOCK & WILCOX COMPANY

IT WAS NECESSARY to apply ⅝-in. hex nuts at various distances along 6-ft. threaded bars. After each nut was set in place and spot welded to the bar, a disk was welded to it. They were used as spacers and separators to control steam flow of a heat distributor.

To turn the nuts on by hand was a tedious process, and cotton gloves supplied for the purpose wore out quickly. One of the machinists conceived the idea of a six-sided cap or socket with two small blades attached as wings to fit over the nut. Air pressure being available, the next step was to apply the air hose on the blades of the wing cap. The nut spun along the bar to its proper place in just a few seconds. The wing cap was then removed and placed on the next nut, and so on until the job was completed.

There were many hundreds of nuts to apply on these 6-ft. threaded bars, equidistant along their length. The job was performed in a few days which otherwise might have taken a few weeks.

Sandblasting equipment for finishing A-26 spar caps was made up from two standard hand blasting cabinets joined together by welding. Inside these cabinets are seven air blast nozzles directed so as to cover every surface of the cap as it is drawn through the cabinet by a steel cable. At either end of the cabinet are wood roller tables to prevent marring the surfaces of the cap. At the far end of the pull-out table is a capstan which draws cable through the sandblast cabinet

Sandblasting

REMOVES SHARP ANGLES FROM ALUMINUM ALLOY SPAR CAPS

BY J. B. ADAMS,
LONG BEACH PLANT, DOUGLAS AIRCRAFT COMPANY

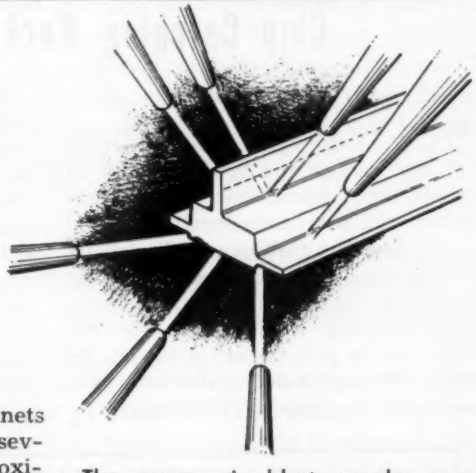
Seven adjustable nozzles direct sand to all of the surface parts of extrusions. Special handling equipment avoids marring of cap

SANDBLASTING has replaced laborious hand deburring and finishing work on aluminum alloy spar caps for the U. S. Army's A-26 Invader attack bomber. Each of the 25 to 28 ft. long pieces formerly required eight man-hours of finishing work. Sandblasting performs the same amount of work 16 times faster.

The equipment consists of two standard hand sandblasting cabinets mounted end-to-end in line and seven adjustable nozzles set approximately at 45 deg. with the line of the spar and 6 to 7 in. from the work. Nozzles are placed so that sand reaches all surfaces of the extrusions. Three nozzles are beneath the spar cap, one in the center and the other two on either side. Four nozzles are directed across the top surface of the spar cap—two on each side. A nozzle is directed into each re-entrant angle.

Approximately 0.0015 in. of aluminum is removed from each surface of the machined spar cap during the sandblasting operation, giving the finished piece a matte-type surface.

All sharp angles from tool marks left by the machining operations are removed by sandblasting. Racks and handling equipment are designed to prevent the surfaces and edges of the spar cap from being marred. Conveyor tables having



The seven air blast nozzles are spaced around the spar cap so that every surface is adequately covered by the sandblast jets. These nozzles are set approximately 45 deg. to the line of the spar and 6 to 7 in. from the work as shown. Nozzles are adjustable and are spaced longitudinally so no two nozzles overlap to direct sand onto the same area

wooden rollers are at both ends of the sandblast cabinets.

All sharp edges are burred with hand tools before delivery to the sandblasting unit. Spar cap sections are placed on a roller conveyor table and a central bolt is used to attach protecting plates to the lug faces. A rubber cushion on each plate covers the lug face and the bushing hole. This assembly includes a hook for attaching a steel cable drag line which draws the spar cap through the sandblasting cabinet.

Matching steel plates with rubber cushions protect the faces of the lug and bushing boss at the large end of the spar cap. A chain connects the two plates, and to this chain is hooked the end of the draw cable. Two cables are used, so that one spar cap can be in process through the machine while the second is being connected

Blasting pressure is adjusted to about 60 lb. per sq. in., to avoid excessive working in any one area, because this causes surface hardening and unnecessary removal of metal. The spar cap moves through the blast area at a speed of 2.6 ft. per min. Nozzles are adjusted as necessary to remove all sharp angles of tool marks.

Approximately 250 lb. of fine garnet or Nevada sand is required for each 50 to 75 spar caps. Sand is used until it breaks down to dust which is gathered in settling tanks.

Fatigue tests conducted on both cantilever and standard Moore rotary beam specimens have shown an increase in fatigue life of from 100 to 300 percent above that of unblasted specimens. Tension fatigue tests on specimens having a hole drilled after sandblasting to simulate conditions found in the finished cap because of bolt and rivet holes also showed about the same increase.

Chip Catching Pockets Should Be Avoided by Tool Designers

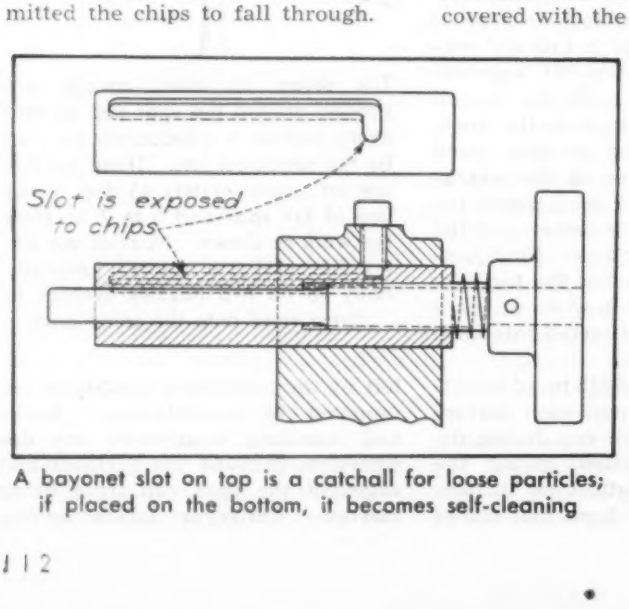
BY M. W. BOSSMAN

MANY of the recent tool designers do not realize the great amount of trouble the production departments have with tools improperly designed from the chip standpoint. Too many times tools are designed and made with pockets where chips accumulate making it necessary for the operator to pull the chips out one by one. Through holes would have permitted the chips to fall through.

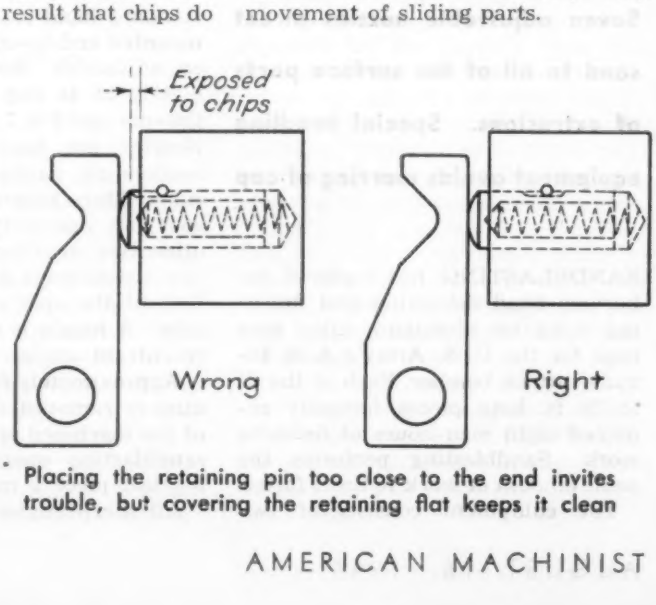
Spring plungers require a pin or key to restrain the plunger from leaving its hole. If the pin is placed too close to the edge, the flattened space on the outside of the plunger is exposed to fine chips, scale or dirt, which eventually pack tightly enough to prevent the plunger from moving. By moving the retaining pin a longer distance from the exposed end of the plunger, only the full diameter of the plunger is uncovered with the result that chips do not affect movement, because there are no openings.

Open slots should be placed so that chips will fall out of and not into the cavity. It requires machining the groove in the bottom of the piece or shielding the opening to exclude bits of metal.

Chips, metal powder and dirt mixed with oil have a habit of packing until they are as hard as the metal itself and effectively stop movement of sliding parts.



A bayonet slot on top is a catchall for loose particles; if placed on the bottom, it becomes self-cleaning



Placing the retaining pin too close to the end invites trouble, but covering the retaining flat keeps it clean

FREIGHT RATES *and* INDUSTRY LOCATION

A SIGNIFICANT decision, announced by the Interstate Commerce Commission last May, will take preliminary effect on the 30th of August. It will eliminate some of the advantage in freight rates which Eastern shippers have enjoyed over shippers of the South and West.

The decision has been enthusiastically hailed as an Emancipation Proclamation for industrial development in the South and West. It has also been roundly condemned as a meddlesome control measure that ignores valid differences in haulage costs, and recklessly blots out one of the important factors in determining the location of American industry.

Cooler appraisals indicate that the net effect of the rate changes will be far less drastic than predicted by the more passionate advocates or adversaries. Nonetheless, it is important for the business world to be informed both upon the principle at issue, and upon the forseeable consequences of the ICC ruling.

What The Decision Calls For

The Commission's order, unless modified, or successfully contested in the courts, will require: (1) the eventual establishment of a single freight classification, or grouping of commodities for rate-making purposes, for application throughout the United States; (2) a single level of *"class rates"*—or rates established for groups of commodities and primarily applying to manufactured and semi-manufactured articles of high value—in the area east of the Rocky Mountains. This level is to be about 15 per cent higher than the present Eastern scale.

Because it will take some time, probably several years, to work out a uniform classification in place of the three major classifications now existing, a preliminary adjustment is provided.

Under this adjustment the existing classifications will remain in effect, but the rates on articles moving on *class rates* will be increased 10 per cent in Eastern or Official Territory—the area east of Lake Michigan and the Mississippi River and north of the Ohio River. On the other hand, the rates will be reduced 10 per cent on articles moving on class rates in the South and West, and on those moving interterritorially.

What The Problem Was

At the present time there are marked differences in the levels of the basic scales of class rates in the five major rate territories—Eastern or Official, Southern, Western Trunk-Line, Southwestern, and Mountain-Pacific. It is difficult to average the levels of rates, but if the level of the class-rate scale in Official Territory is taken as 100, the levels in the other territories may be roughly considered as follows: Southern, 139; Western Trunk-Line, 128, 146, 161, 184 in Zones I, II, III, and IV, respectively; Southwestern, 161; Mountain-Pacific, 166.

These are over-all comparisons. On many individual articles the differences in levels of rates are greater or less than indicated because of offsetting differences in regional classification schemes. In many cases, the use of exceptions to the classifications and of special commodity rates has reduced the regional disparity in rates. In fact, on some articles, particularly on certain low-grade traffic such as logs, pulpwood, bricks, coal, sand and gravel, the South and the West have actually had lower rates than Official Territory. The rate disadvantage of the South and West has been principally on manufactured articles.

The territorial differences in class-rate levels have complicated the problem of constructing rates from a point in one territory to a point in another. Today, such a rate tends to represent a blend of the levels in effect at the place of shipment and at the destination. Thus manufacturers and dealers in a higher-rated territory are likely to see themselves at a disadvantage when they attempt to sell goods in a lower-rated territory against competition located there.

Now, if differences between territorial rate levels are removed, the *inter*territorial freight-rate problem largely disappears. So it is an important question whether such differences are justified. The Commission has found that they are *not* justified either by differences in transportation costs or by

other valid considerations. From that finding came the order to establish a uniform level of class rates and a single freight classification.

The Decision And The Map Of Industry

What effect will this decision have on the location of industry in the United States; and what effect will it have on the economic development of the East, the South, and the West?

Today, many in the West and South believe that their higher class rates have seriously retarded the industrial development of these areas, and promoted the concentration of manufacturing in Official Territory. They point out that Official Territory has over 50 per cent of the population of the country, had nearly 70 per cent of the persons employed in manufacturing in 1940, and accounted for nearly 73 per cent of the "value added by manufacture" in 1939. Boasts of industrial development in the South, and to some extent in the West, in recent years are accompanied by claims that this would have been greater but for the freight rate structure.

Another point gets into the argument. Official Territory is not only the country's most highly industrialized section, but also its greatest consuming territory. It is the market which nearly all manufacturers desire to reach, particularly when they have a surplus to sell. Here again is occasion for an outcry by producers outside of Official Territory against the consequences of their high rate levels and the levels of interterritorial rates. Under the circumstances it is not strange that the South and West have argued long and volubly for mile-for-mile equality in rates.

Those in Official Territory deny that the South and West have been handicapped by the rate adjustment, but at the same time look with apprehension at the loss of their rate advantage.

What's The Effect?

However, now that the ICC's ruling is about to be put in operation, it is time for the colorful statements of the debating period to give way to a sober appraisal of what the consequences are likely to be.

In the first place, it should be noted that the preliminary adjustment will affect only a small fraction of the traffic. Estimates indicate that only about 4 per cent of the full-carload traffic moves on regular class rates. About 11 per cent moves on exception ratings which are not affected by the preliminary order; and about 85 per cent moves on commodity rates, which were not within the scope of the Commission's decision. The proportion of less-than-carload lot traffic affected is much greater, since a large part of it moves on class rates; however, less-than-carload traffic constitutes less than 1½ per cent of the total tons carried.

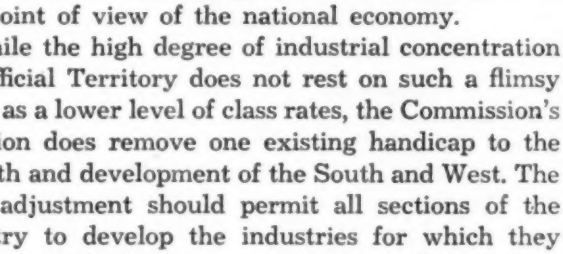
The permanent rate structure will probably affect more traffic than the preliminary order since, in the establishment of a uniform classification containing more classes than at present provided, many articles now moving on exception ratings are likely to be brought within the scope of the classification, and the same may be true of some articles moving on commodity rates.

But, even if a large proportion of the traffic were affected by the Commission's order, or if the principle of equality in rate levels is eventually extended to much of the traffic moving on commodity rates, these freight-rate adjustments cannot be expected to revolutionize the pattern of industrial location in the United States.

It seems evident that most industries now found in Official Territory are located there for other advantages than that of a lower level of freight rates, undeniable as such an advantage is. Insofar as that is the case, they have little to fear from equalization of the rate levels. For those which have, indeed, been dependent upon preferential rates and otherwise badly located, the removal of the preference and their consequent shift to some area possessing a real locational advantage would be desirable from the point of view of the national economy.

While the high degree of industrial concentration in Official Territory does not rest on such a flimsy basis as a lower level of class rates, the Commission's decision does remove one existing handicap to the growth and development of the South and West. The new adjustment should permit all sections of the country to develop the industries for which they have natural advantages. It should contribute to a sounder regional specialization than we have heretofore had.

This decision will neither destroy the economy of the industrial East, nor will it, overnight, assure the industrial flowering of the South and West. It constitutes one sound step toward establishing that equality of opportunity for all sections of the country which is essential to a nation that bears the proud title of The *United* States.



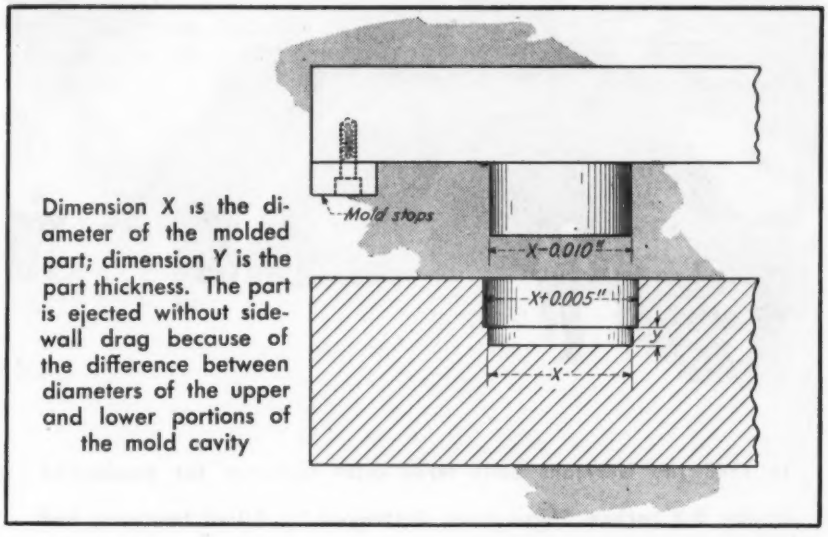
President, McGraw-Hill Publishing Co., Inc.

THIS IS THE 38TH OF A SERIES

MODIFIED POSITIVE MOLD Avoids Flash on Part Diameter

BY HARRY G. WESSEL, FOREMAN, DIE AND MOLD DEPARTMENT,
WESTINGHOUSE AIRBRAKE COMPANY

By throwing the flash to the upper surface of the part, it is removed when disk sanding to true the mounting surface



Dimension X is the diameter of the molded part; dimension Y is the part thickness. The part is ejected without sidewall drag because of the difference between diameters of the upper and lower portions of the mold cavity

THREE KINDS OF MOLDS are in use for compression molding of plastics parts; namely, the positive, semi-positive and flash type. Most engineers, mold designers and commercial molders prefer either the semi-positive or flash-type molds.

The positive-type mold is rarely used, because an exactly weighted charge of molding compound must be used to maintain uniform thickness in the molded part. For hand-molds or semi-automatic molds, the operator must do the weighing or he must be supplied with accurately weighed preforms. But when positive molds are used on automatic presses, slight inaccuracies in the charge are caused by the mechanism which feeds the molding compound into the mold cavities.

Recently we purchased a fully automatic molding press of a new design. The manufacturer of this press submitted a design for a multiple-cavity mold of the semi-positive type which would produce a part with the flash molded on the outside diameter. One of the requirements of the molded part was that one side be a flat surface for mounting purposes. Because of slight warpage in the molded part, a disk-sanding operation was necessary to produce the flat surface desired.

The mold was built in our plant, but the design was changed to the positive type to eliminate the additional operation of removing flash from the outside diameter of the piece. In this type of mold the flash was removed and the warpage of the part corrected in the one disk-sanding operation.

When this mold was received by the press manufacturer, he stated that it would be impossible to maintain the required part thickness. But the press and mold have been in operation in our factory and have produced over 200,000 parts on which a thickness tolerance of ± 0.003 in. has been maintained.

The mold was built as illustrated, and is only a slight variation of the so-called positive-type mold. The lower portion of the mold has been modified by increasing the cavity diameter 0.005 in. for the portion above the required part thickness. This permits free ejection of the molded part and eliminates any tendency to bend the part during ejection. The force, or plunger, was made 0.010 in. smaller in diameter than the mold cavity. This difference of 0.015 in. in diameter between the plunger and the mold cavity gives a clearance of 0.0075 in. per side, through which any excess compound can escape. Four stops were mounted with capscrews on each corner of the mold, and by changing the thickness of these stops the part thickness can be easily controlled.

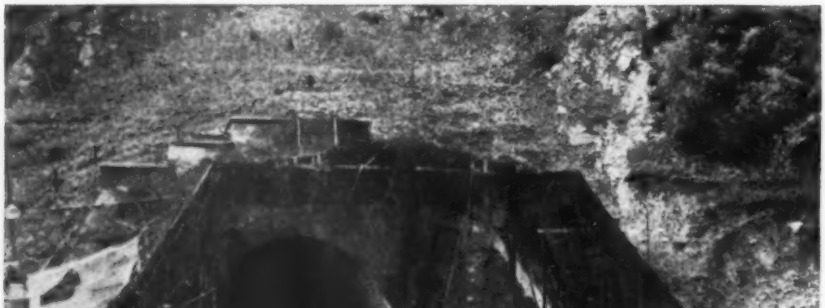
Wherever the design of the molded part permits, this type of mold construction has proved satisfactory in controlling part thickness. In hand molds the part thickness can be controlled by grinding the plunger to produce the desired thickness, while in semi-automatic or automatic molds the stops shown are ground to produce the same results.

Hot Chips

IN TURNING the ogive on large shell, a 1 7/32 in. chip is reported as taken with a heavy carbide-tipped tool, the machine being driven by a 100 hp. motor. The observer reports that chips coming off the machine are nearly white hot. It is also stated that a British machine is being used for this operation, which does not employ coolant.

In another case, steel forgings of medium tensile strength are being turned experimentally at 1,000 surface feet per minute. No details are available, except that the machine is designed for carbide tools.

Nazi Assembly Technique on V-2 Bombs Revealed in Underground Factory



In 1943 the Germans built three pilot factories for production of the V-2 rocket. These were destroyed by Allied bombers, and the bomb-proof underground factory at Nordhausen was constructed. This was captured after reaching a production of 900 rockets per month. Ordnance Technical Intelligence visited the factory immediately after its capture and reported the information given here

BY W. J. HARGEST

AMERICAN MACHINIST WAR CORRESPONDENT

WHEN ELEMENTS of the First U. S. Army entered Nordhausen, Germany, they found what is said to be the largest underground factory in the world. Known as the "Mittelwerk" plant, it was engaged in the production of the V-2 rockets, the V-1 flying bombs, turbines for rocket or jet aircraft, and 10-cm. anti-aircraft high-altitude rockets.

Hundreds of V-2's in various stages of completion were found on an assembly line resembling those in Detroit automobile factories. Although retreating S.S. guards carried practically all of the administrative and technical staffs with them, one engineer of some importance remained when the First Army took the area. This man—Alben Sawatzki—was in charge of plans and operations for the whole plant, and revealed much important information.

The Mittelwerk plant is located in a large limestone hill called Kohnstein. The tunnels were started originally by the Wissenschaftliche Forchungs Geschellschaft—(WIFO—a government sponsored and financed firm)—for the safe storage of critical chemicals; however, it was selected in September, 1943, to be site for the only V-2 factory in Germany. The finished plant consists of two parallel tunnels about 1¼ miles long and ¾ mile apart. Connecting the main entries are 46 cross tunnels. Actually, the Mittelwerk factory included only the section comprising tunnels Nos. 20 through 46. The Junkers Aircraft Company occupied tunnels Nos. 1 through 19, and this section was not considered a part of the Mittelwerk plant.

Although V-2's were the main item of manufacture in the Mittelwerk plant, a large production and assembly line for V-1's had also been installed. Production in the V-1 section, as reported by Sawatzki, was 175 flying bombs per day. He also said that production of V-2's had reached 30 per day just before the plant was captured. As mentioned before, other sections of the factory were in production on turbines for jet planes, and on anti-aircraft rockets.

Manufacture and Assembly

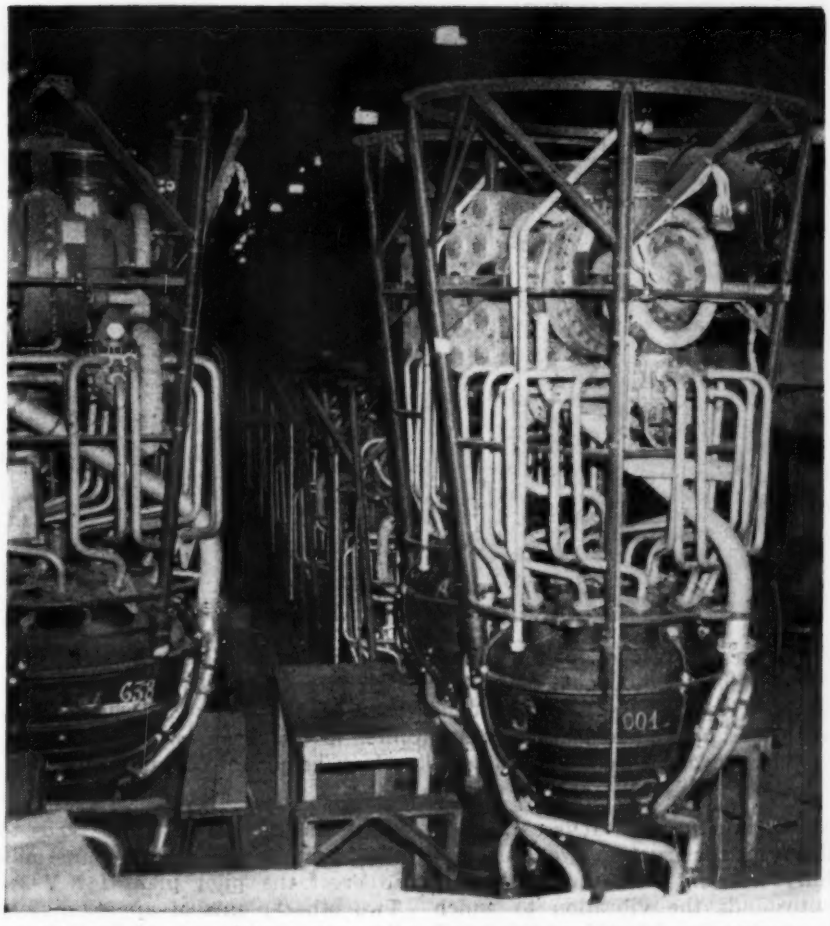
German engineers made the most of space limitations necessarily encountered in a factory comprised of tunnels. The ladder-like arrangement of the tunnels was planned and laid out for flow-line production. Parts and stock left one of the parallel tunnels, proceeded during fabrication through appropriate cross tunnels on conveyors or rolling jigs to meet the main assembly line in the second parallel tunnel. As a matter of fact, little or no backtracking of sub-assemblies was necessary. The V-2's traveled along a definite course in the plant until the finished and tested product was shipped. German army inspectors checked parts during every stage of production, and every item was tested in much the same manner as in U. S. Ordnance factories.

Although in the beginning many subassemblies such as the V-2 tail section were made elsewhere in Germany and sent to Mittelwerk for final assembly, the plant could and did manufacture every part and component for this 1-ton high-altitude rocket, excepting small electrical and radio parts and a few components for the control gyro-

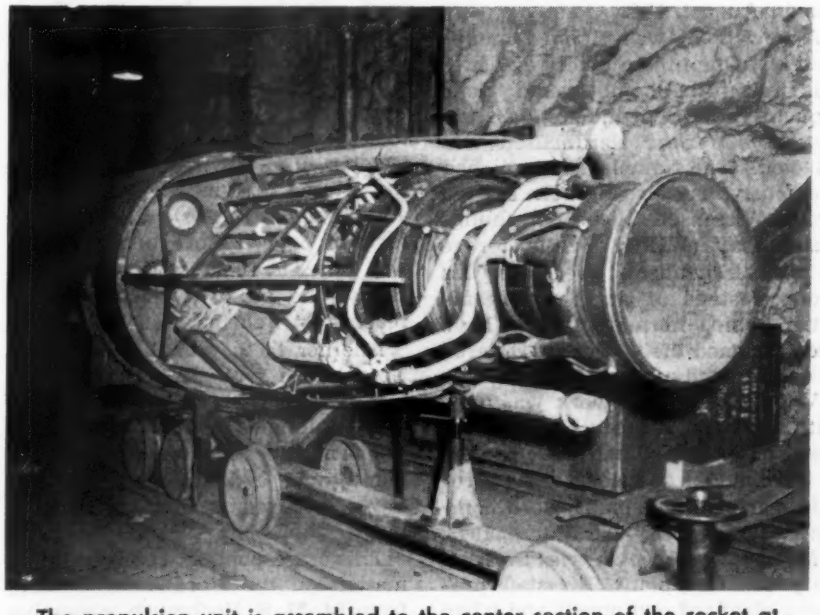
scopes. The plant was in every sense tooled for mass production. Gravity rollers, rolling jigs, power conveyors, bridge cranes, and monorail cranes were among the mechanical handling equipment. Every convenience for selected German personnel was installed, including the best of canteens and rest rooms. The plant was equipped with the most modern of heating and ventilating units to eliminate moisture detrimental to machine tools and other metalworking equipment installed underground.

The first step in manufacture was to cut and form the skin for the center or fuel section of the rockets, fabricated in longitudinal halves. In the initial stage, both halves were identical and interchangeable, and not until after the installation of wiring was there a noticeable difference between one half and the other. The cut skin was formed around stringers fitted at locations points around a semi-circular jig resembling a standard airplane fuselage jig. As the skin was formed to the stringers it was assembled to them by resistance welding.

The fairly rigid halves were taken from the jigs and moved forward in a cradle to another section of the same cross tunnel where they were given a coating of glass wool insulation, this being spread evenly over the interior of each half. Just prior to this, the required electrical and pneumatic connections, which ran from the control section to the rear,



Here is the propulsion unit in final stages of assembly in one of the cross tunnels. The assembly includes the turbine, turbine fuel tanks, venturi and thrust frame, each fabricated in adjacent tunnels with small connecting passages to maintain flow-line production. Note the thrust frame, which is light in construction, and yet withstood terrific vibration on firing and on re-entering the atmosphere during descent

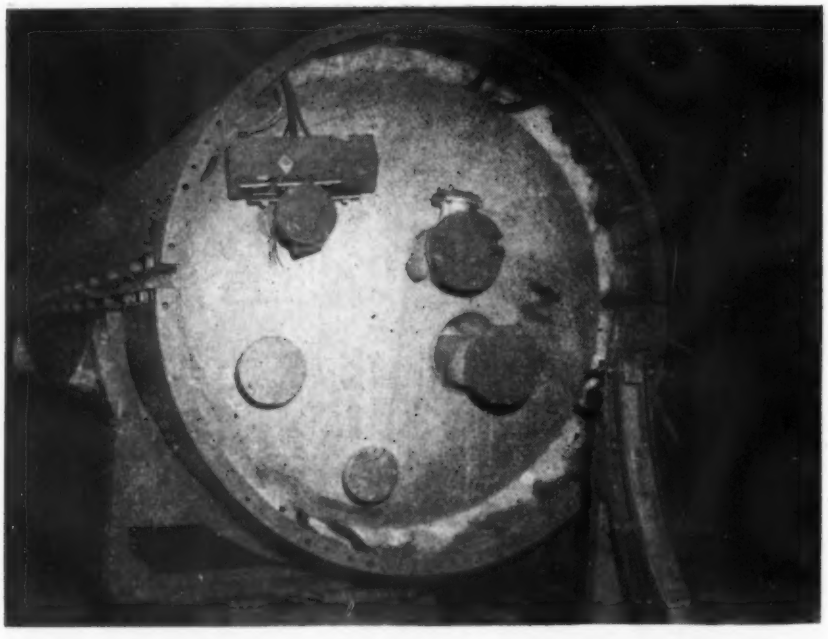


The propulsion unit is assembled to the center section of the rocket at the junction of a cross tunnel and the main assembly tunnel. It was turned from a vertical to a horizontal position by slings suspended from a monorail crane, and during assembly was supported by a single leveling jack mounted on a four-wheel dolly

were installed. It was at this point that the two halves were mated.

Oxygen and alcohol tanks, manufactured in two adjacent cross tunnels, were fed to the assembly line, and were installed in the center section of the rocket. Immediately afterwards, the ogive was reinforced by riveting on an extra layer of skin. This reinforcement was found necessary because of the great heat and vibration to which the rockets were subjected upon falling into the atmosphere from heights of 65 or 70 miles, which caused the earlier rockets to disintegrate in the air.

At subsequent stations along the assembly line, the thrust frame, turbine, turbine fuel tanks and venturi were installed and the proper connections made. These subassemblies and their components are fabricated in the cross tunnels. It should be noted that one of the best designed components of the entire rocket was the thrust frame, which attaches the venturi to the rest of the fuel and



Oxygen and alcohol tanks, fabricated in cross tunnels, meet the main assembly line at this point, and are installed fore and aft in the center sections. Note the glass-wool insulation between the tanks and the frame. This was applied to minimize heat-transfer to the tanks when the rockets hit the atmosphere upon descending from heights of 65 to 70 miles

combustion system. It is extremely light in construction, yet successfully transmits the thrust; also, it withstands the vibration to which the rocket is subjected on firing and on penetrating the atmosphere during descent.

Venturi and pump sections of the rocket were covered with an outer skin and fins were assembled at stations on the assembly line. The rockets, as shown in the illustrations, were mounted on dollies fitted with cradles for all the major assembly operations. Once the rocket reached this stage, the complete control section was tested, after which they were immediately fitted to the rocket. It was then complete, except for the war head. This was not attached until the V-2 reached an assembly area near the firing site.

Development of Manufacture

In July, 1943, Sawatzki was employed as development engineer at the Hanschel tank factory in Kassel. Karl Asuer, who was then head of the technical subdivision of the Ministry of Ordnance and Ammunition, ordered Sawatzki to report to a Herr Degenkolb, one of the directors of DEMAG—Deutsche Maschenbau Actien Gesselschaft. Degenkolb showed Sawatzki the plans for the rockets, and discussed with him the erection of a pilot plant. As a result of this and subsequent discussions, Sawatzki took 2,000 technicians and mechanics of all skills to the island of Usedom in Pomerania to erect the pilot plant for V-2's. Two other plants of approximately the same size were to be built at the same time, one at Friedrichshafen and the other in Wiener Neustadt. The objective of these three plants was to manufacture 300 pilot models of the rocket. However, all three plants were destroyed during erection in August, 1943.

A new plant was planned immediately. One of the chief requisites was that it be bomb-proof. Consequently, in September, 1943, the present site near Nordhausen was selected. The tunnels, as mentioned previously, had already been started by the Wissenscheftliche Forschungs Gesellschaft (WIFO) for the storage of critical chemicals; therefore, this group, instead of the Todt organization which normally would have been assigned the work, was ordered to enlarge and extend the tunnels as a V-2 factory. The work was done with the help of labor battalions of the Waffen S.S., which were pushed to the limit of endurance. As a result, parts of the plant were completed in February and March, 1943.

Meanwhile, Sawatzki was drawing up production plans. His staff procured standard equipment and when necessary designed and built special jigs, fixtures and mechanical handling units. Installation of machine tools, other metal-working equipment, tracks for assembly dollies, welding equipment, cranes, heating and ventilating units, personnel conveniences, electrical equipment, drainage lines and pumps, tiling of rooms and tunnels, and arrangement of portable and semi-portable equipment proceeded progressively with completion of tunnel sections. Therefore, as soon as the first parts of the tunnels were finished, the production of small parts and subassemblies began immediately. When the tunnel system was finally completed, production of V-2's was underway in a matter of weeks. As a matter of fact, some large subassemblies for the rockets were finished and ready as early as November, 1943.

Up to this date, the plant had neither name nor organization, since WIFO was in control of construction. In November, however, the plant was organized as a firm with the name of Mittelwerk, with a Dr. Kettler as general director.

Due to production kinks and troubles, no sizable quantity of V-2's were turned out until May, 1944, when 300 rockets were produced. In the following month, production fell to 200, because of design changes dictated by unsuccessful field tests. Then production stopped for a short period. Finally, in September 1944, 300 V-2's were again run off the assembly lines.

Meanwhile tests were constantly being made in Penad at Heidelager near Mileck. The rockets were still not structurally perfect and design faults were constantly being discovered. Production from the Nordhausen factory continued, nevertheless, and completed rockets were being reworked to incorporate design change after design change. This took place between May 1944 and October, 1944. Finally, in that month, the altered designs were considered acceptable and the signal was given for full capacity production, which was to be 900 rockets per month. Actually, the peak was 700 monthly, reached in February, 1945.

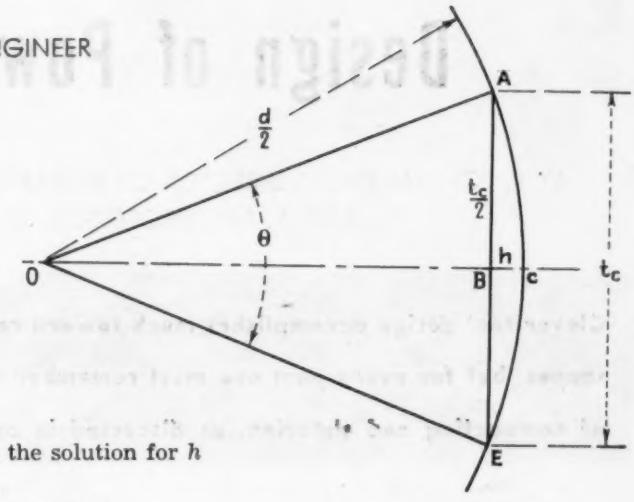
Another factory in the vicinity of Nordhausen was discovered where V-2's were found in various stages of completion. However, interrogations and investigations revealed this plant to be a disassembly shop for V-2's damaged at firing sites or in transport.

This correspondent received information on the Nordhausen factory from Lt. M. S. Hochmuth, a member of one of the Ordnance Technical Intelligence teams that investigated production facilities in this underground plant.

Calculations for Spur Gear Corrections

BY G. V. BRADBURY, RESEARCH ENGINEER

Gear calculations in general are tedious chores requiring much time and patience. Methods of reducing the time for chordal arc and addendum corrections are given



THERE ARE two calculations necessary to the design of spur gears that require, when standard methods of calculation are used, a great deal of time for their completion. These are the correction to the addendum and the determination of the difference between the chord and the arc of the tooth thickness.

The following methods of calculation for these dimensions require considerably less time for completion than the usual handbook methods and eliminate the necessity for eight-place tables. In addition, the methods are applicable to gears having tooth thickness arc and tooth spacing arc unequal, a condition which places the conventional methods at disadvantage. This is accomplished with no sacrifice in accuracy, and, in many cases, calculations by these methods will prove to be more accurate.

The accompanying figure illustrates the basic information necessary to the derivation of the required dimensions.

$d/2 =$ *pitch radius* or *pitch dia./2*
$t_c =$ *chordal tooth thickness* $= \overline{ABE}$
$h =$ *correction* $= \overline{BC}$
$\overline{ACE} =$ *circular thickness of tooth*

In the right triangle OAB

$$\overline{OA}^2 = \overline{OB}^2 + \overline{BA}^2$$
$$(d/2)^2 = (d/2 - h)^2 + (t_c/2)^2$$

then,

$$d/2 - h = \sqrt{d^2/4 - t_c^2/4}$$

and,

$$h = d/2 - \sqrt{d^2/4 - t_c^2/4}$$
$$= d/2 - d/2\sqrt{1 - t_c^2/d^2}$$
$$= d/2\ (1 - \sqrt{1 - t_c^2/d^2})$$

The term under the radical may be expanded into the convergent series:

$$\sqrt{1 - (t_c^2/d^2)} = 1 - (t_c^2/2d^2) + \ldots$$

When all terms but the first two are negligible due to t_c^2 being very much less than d^2, the solution for h is:

$$h = d/2\ [1 - (1 - t_c^2/2d^2)]$$
$$= t_c^2/4d$$

This solution will be accurate to the fourth decimal place, suitable for pinions having ten or more teeth.

The calculation for the determination of the difference between the tooth arc and the tooth chord requires, with usual methods, eight-place tables. The following method eliminates this necessity without sacrifice of accuracy.

The circular thickness t is the arc $\overline{ACE}$, subtending the angle θ, measured in radians.

$$t = d/2 \times \theta$$
$$t_c = d/2 \times 2 \sin \theta/2$$

and the difference:

$$t - t_c = d/2 \times \theta - d \sin \theta/2$$

When $\sin \theta/2$ is expanded into the series:

$$\sin \theta/2 = \theta/2 - \theta^3/2^3 \times 6 + \ldots\ldots$$

where the terms of the series beyond the first two are negligible due to the minor quantity of θ:

$$t - t_c = d\theta/2 - d\ (\theta/2 - \theta^3/48) =$$
$$d\theta^3/48 = d/48 \times (2t/d)^3 = t^3/6d^2$$

This solution for the difference between tooth arc and tooth chord is accurate to five decimal places and approximately accurate to six places. It will be noted that the difference between arc and chord will be negligible for gears of thirty or more teeth. It is small enough to permit the substitution of either for t in the expression $t^3/6d^2$.

Beryllium Copper Successfully Drilled

BY JOHN J. O'WRIL

BERYLLIUM COPPER presents many machining difficulties. It is hard, has high strength and is a poor conductor of heat. Consequently, the means for carrying away the heat from the cutting edge must be positive to avoid burning drills.

When faced with drilling a ⅛ in. hole by 1 in. deep in 5,000 pieces of ¼-in. beryllium copper rod, conventional methods were not successful, even though high-speed drills were used. Some means were required for adequate cooling of the drill.

The solution to our problems was to reverse the position of the drill and the beryllium-copper rod.

The drill chuck jaws were ground in position with a Dumore grinder mounted vertically on the drill press table by fastening it to an angle bolted to the drill press table. By opening the drill chuck jaws and using a small wheel, the jaws were trued by raising and lowering the drill spindle while the chuck was rotated.

Next, a watertight pan was put on the table, then a drill holding block was placed inside the pan and fastened to the table after it had been located in its correct position. With the drill chuck ground concentric and the drill holding block centered with the drill spindle, everything was lined up for precision work.

Processing Techniques Affect Design of Powder-Metal Parts

BY P. SCHWARZKOPF, DIRECTOR OF RESEARCH, AMERICAN ELECTRO METAL CORPORATION
AND A. REIS, PROFESSOR OF METALLURGY, COOPER UNION

Clever tool design accomplishes much toward realizing intricate shapes, but for every part one must remember the peculiarities of compacting and sintering, as discussed in an earlier article

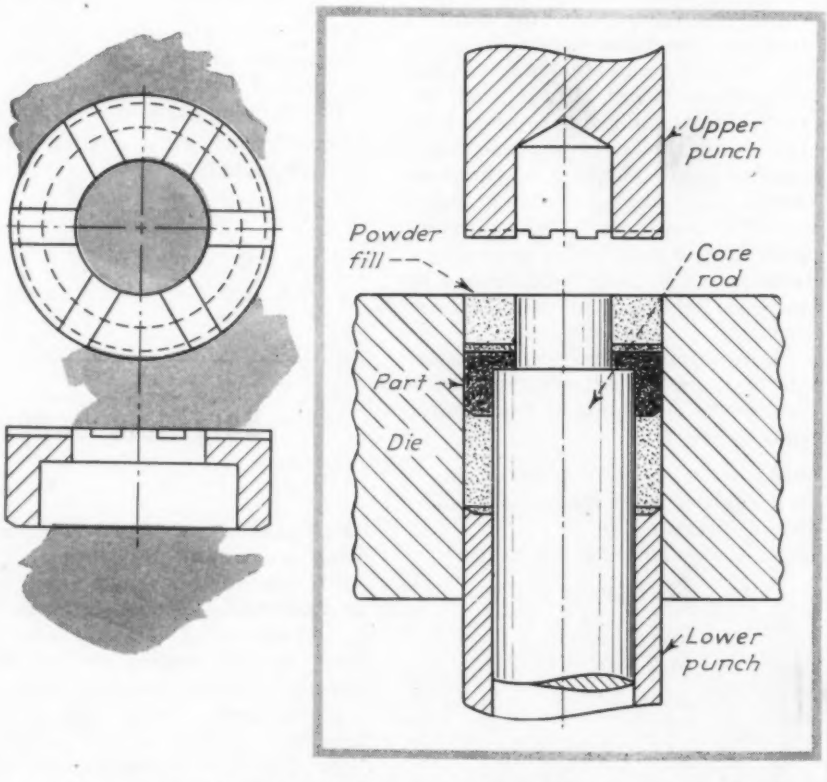
WHEN WORKING out the design and specifications of powder-metal parts with experts in that field, manufacturers and engineers will find helpful a knowledge of the limitations imposed by the peculiar characteristics of powder-metallurgy processes. These limitations arise chiefly from the compacting operation. Certain features of design are prohibited; namely, those which are incompatible with the kinematics of compression and ejection. Examples are undercuts, re-entrant grooves, threads, holes perpendicular to the axis of compression. Such features are easily produced by subsequent machining of powder-metal pieces falling in the category of technically dense parts.

The above limitations are absolute; more numerous and diversified are those which are gradual with respect to shape or size. No rigid rule can be given for permissible size and shape. Difficulties here increase with mass of the article and the relation of length to cross-section, the resistance of the powder to plastic flow and with requirements for strength and ductility after sintering the part. A shape may be technically feasible, but unsuited to mass production.

Compaction and ejection difficulties arise from a number of circumstances. If the height of the compact is excessive with relation to the cross-section, uniform compacting may not be achieved, and friction on the side walls of the mold becomes a limiting factor in mass production. On the other hand, compacting and ejecting are easy if the dimensions of the part normal to the axis of compression exceed the height of the compact. Excessively thin parts cause ejection troubles because the green compact is too weak. A thin-wall tube for example, would entail trouble because of friction in compacting and ejecting.

Low bosses and shallow depressions are feasible on the ends of the compact, because they do not overtax the lateral-flow properties of the powder. Abrupt and large changes of dimensions parallel to the axis of compression are unesirable because it is difficult or imposible to control punch action so that uniformity is secured in distribution of the compacting pressure and apparent density. Complicated designs may require the use of sub-divided, independently controlled punches and special techniques.

Pins and narrow, deep recesses, feather edges and the like cannot be produced satisfactorily. Internal



A coupling part with six radial slots in the upper face is an example of articles well suited to manufacture by powder metallurgy, because the piece is prodced in one stroke instead of by several set-ups on machine tools. In the tooling arrangement for this piece, the upper punch has protuberances for making the slots, the face of the lower punch is properly recessed to make the chamfer on the part, and the stationary core rod not only estabishes the diameters of the stepped holes in the piece but also the wall thickness under the slots

angles and sharp corners at points of intersection cannot always be molded. Often incorporation of small fillets is advisable; beveled edges in the direction of pressing are difficult to make as they imply undue stresses on the punches. In these and similar cases, care must be directed toward avoiding excessive die wear at danger spots.

Design of powder-metallurgy parts must, of course, include die design as one of its considerations. Shapes requiring dies of inadequate strength must be avoided. Hence designs requiring dies with feather edges for steep bevels, or fine core rods are not practical.

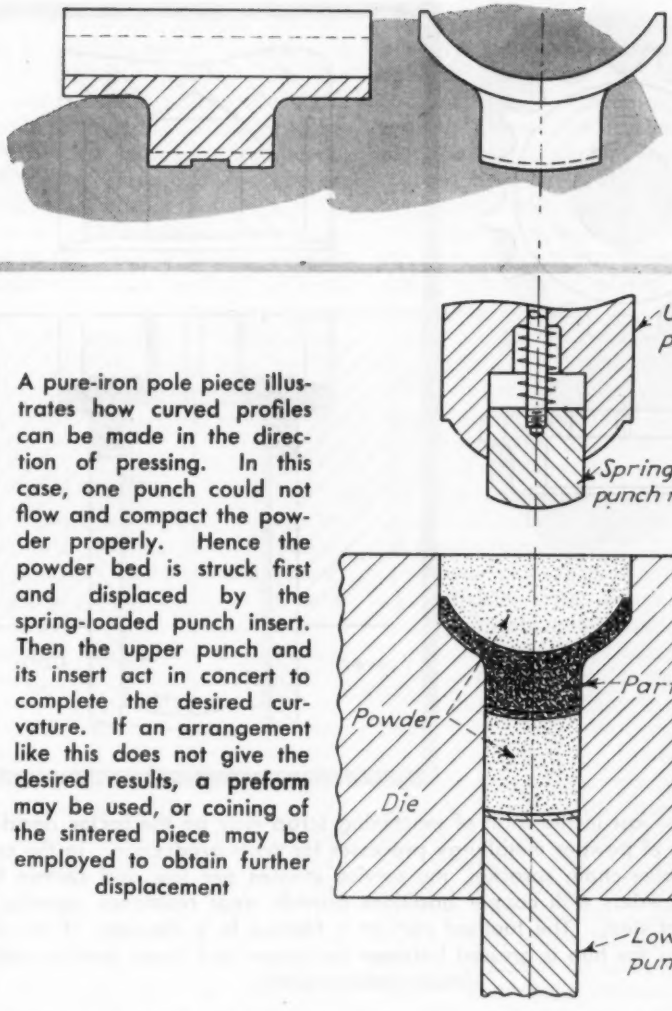
Curved surfaces can be formed by shaping either the mold—and if need be a core rod—or the surface of one or both punches. The admissible shapes of mold and core rod are strictly limited by the kinematics of compression and ejection to cylindrical and profiled surfaces running parallel to the axis of compression.

Curved Punches

Curved punches impose limitations. However, a procedure has recently been developed for obtaining a wider range of shapes in mass production. One curve is used for the compacting punch, another of different shape for the coining punch. In the green compact, the density is not uniform over the cross-section; uniformity is achieved by the coining operation employed after sintering.

Smaller tolerances can be applied to the radial dimensions of the part than to those in the axis of compression. Fluctuations in the powder charge will be reflected in the height of the compact as well as in density. Automatic mold filling by volume is the rule, and hence the amount of powder per fill may vary slightly from cycle to cycle and even more over a long period of production because of changes in composition and apparent density of the powder. Changes in compactibility of the powder also cause dimensional variations.

In the green compact, only the height is a variable, but sintering may affect other dimensions, depending upon conditions that prevailed in various parts of the mold during the compacting operation. Growth or shrinkage of powder-metal parts during sintering can be controlled or at least predicted, and amounts to only a few thousandths of an inch per inch at most. The most effective means of controlling tolerances is to size the piece by a coining operation after sintering.



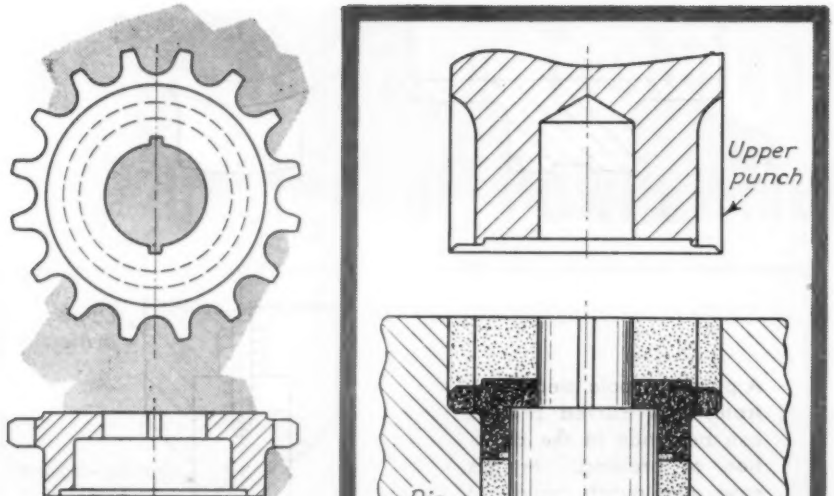
A pure-iron pole piece illustrates how curved profiles can be made in the direction of pressing. In this case, one punch could not flow and compact the powder properly. Hence the powder bed is struck first and displaced by the spring-loaded punch insert. Then the upper punch and its insert act in concert to complete the desired curvature. If an arrangement like this does not give the desired results, a preform may be used, or coining of the sintered piece may be employed to obtain further displacement

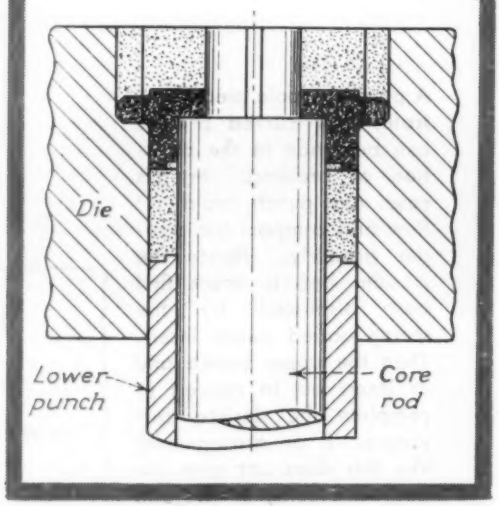
In tubular parts, the standard tolerances for eccentricity are several times the diameter tolerances because of possible cumulative effects.

Experience with powder-metallurgical materials demonstrates that their usefulness in most applications does not depend upon their ability to meet customary specifications for static strength and ductility. Figures of that sort are of doubtful value for estimating the characteristics of powder-metal articles of less than 100 percent density. In other words, the procedure for preparing test specimens is open to question, regardless of whether they are briquetted directly from powder or cut from a larger part. A much better criterion of quality than the usual bending, impact, hardness and tensile tests is an actual service test. Often materials of low strength and ductility are entirely acceptable, because the engineer actually requires some special characteristic available through powder metallurgy, such as anti-friction qualities or wear resistance. The advantage of discovering the most profitable applications of powder metallurgy will lie with those who are free from prejudice.

Many wrought and cast materials can be duplicated in the laboratory by powder-metallurgy materials having much the same composition and the same characteristics. This, however, can be achieved only by close approach to 100 percent density and by expensive processes involving either numerous operations or the use of excessive pressures and temperatures. Cheap mass production in powder metallurgy results in products of appreciable porosity having less ductility and static strength than wrought or cast products of the same composition. If the attempt is made to achieve high figures for ductility, strength and toughness, there is no reason for selecting existing wrought or cast products as the standard of final perfection. Powder metallurgy methods are free from many limitations to which other processes are subject, and they have proved capable of producing materials of superior properties.

As the characteristics of powder-





Material lost in the form of machining scrap may be the factor deciding the use of powder metallurgy processes for parts production. In the case of a roller-chain sprocket, the service stresses are low and certain ferrous powders with copper additions provide wear resistance superior to wrought steel. The toothed portion is formed in a shoulder of the die, whereas the hub is pressed between the upper and lower punches which move independently

metallurgy materials depend upon their degree of porosity, the terms "dense" and "porous" need careful handling if misunderstandings are to be avoided. Porous products, in the language of the art, are those in which a standardized porous structure and a high degree of porosity are essential for their purposes. Filters and "oil-cushion" bearings belong to porous products in this technological sense. "Porous" materials are offered with specified porosity figures ranging from about 25 up to more than 45 percent. Recently, even the denomination "self-lubricating" has been applied both to oilcushion materials and to materials requiring no specific porosity figure and ranging far below 20 percent.

Inexpensive mass fabrication by powder-metallurgy methods results in materials having an appreciable but unspecified percentage of porosity. Some are classified into several grades, differing in porosity, strength and ductility, and are made and marketed according to application requirements. In powder metallurgy, transitions exist all the way from high porosity to perfect density, and there is no dividing line between porous and dense products other than that given by the use of the terms in the technological sense.

Ferrous powder-metallurgy materials are divided into four groups, which differ in chemical analysis:

1. Pure iron, used mainly for certain magnetic and machine parts;
2. Iron plus carbon, generally used for machine parts;
3. Steel alloys, used mainly for magnetic and machine parts;
4. Iron-base materials with minor additions of sort metals such as copper, aluminum, and lead, especially for anti-friction elements.

Magnetic products are frequently alloy compositions. When made from pure iron powders, they are fabricated to specification with standardized magnetic (and, if need be, electrical) properties. The iron powder is selected and refined according to the required properties of the magnetic material.

Materials made from mixtures of iron and graphite powders are produced in different grades, the figures for density and ductility decreasing with rising carbon content. Generally, these materials are divided in three grades with carbon contents ranging from 0.1 to 2.5 percent. In their mechanical characteristics, materials in the highest range of carbon content are similar to gray cast iron; in the lowest range they approach mild steel. If pure powders of intermediate carbon contents are employed, remarkably high strength figures are obtainable after heat-treating.

Tailor-Made Alloys

Alloyed steels made by powder metallurgy are expensive and require special techniques. Each composition requires careful processing operations, and at present a market for these "tailor-made" alloys can only be found where special properties are desired.

Iron with minor additions of soft metals is finding increasing applications in powder metallurgy. The raw material is prepared from the pure metals either by mixing two powders or by coating iron particles with copper, lead or other metals. The metal added to the iron powder has, as a rule, a finer particle size than the iron, and the mixing operation is carried out under conditions which assure that the soft particles are rubbed into the surface of the iron particles, thus achieving a fairly effective coating. The amounts added vary within wide ranges—for copper, for instance, from 2 to 25 percent. Often, they exceed the solid solubility of the added metal in iron; the resulting microstructures cannot be duplicated by fusion.

The materials of this group offer advantages both as to properties and to manufacturing process. Compacting and sintering can be performed without using either high pressure or temperature, and the materials have satisfactory strength and corrosion resistance. A wide range of mechanical characteristics is obtained by modifying the chemical analysis and microstructure of the powder and the porosity of the material.

The wide use of ferrous materials is a recent development in powder metallurgy. In the 30's, copper-based alloys occupied first place in compositions very much like the usual bronzes — tin bronzes, phosphor bronzes and others. Brasses, sometimes strengthened by minor additions of other elements, appeared later and found less extended applications. Bronzes are mostly briquetted from a mixture of copper and tin powders, while pre-alloyed

powder is used for brass. Copper-based, like iron-based, alloys are fabricated both within high and low ranges of porosity.

Aluminum-base powder metallurgy materials have met with some success. Their compositions are similar to those of the usual wrought aluminum alloys.

In mass production of machine parts, all the materials described above are briquetted in their final shapes. Recently some standardized materials, both ferrous and nonferrous, have been produced and marketed in cored and solid bars, strips and plates for machining to shape for experimental and other purposes. The availability of bar and plate stock may accelerate the applications of these materials to new designs.

Any rigid classification of parts made by powder metallurgy would fall short of giving complete satisfaction today and will probably be outdated by the developments of tomorrow. On the basis of anti-friction and friction effects, machine parts may be divided into the following groups:

1. Parts to be oil-impregnated.
2. Dry anti-friction effects.
3. Friction effects.
4. Parts used for economy only, claiming no advantages in characteristics.

Among the oil-impregnated parts, no attempt will be made to describe the special features of parts with specified porous structure and high porosity range. Attention is directed instead to products of unspecified porosity, sufficient for securing resistance to seizure and galling by means of an oil film instantaneously supplied from the pores under any service conditions, but with no requirements as to the quantity of oil stored in the porous system. As a rule, these parts run under oil. Their porous character may be combined with requirements as to static and dynamic strength. The higher the strength desired, the lower will be the porosity in materials otherwise comparable. If there are no requirements of strength, hardness and shock resistance, both raw materials and processing conditions will be determined by economic considerations. The materials used are chiefly iron, with a wide range of carbon content, and bronzes.

The machine parts in this category include plain, flange, thrust and spherical bearings in a wide range of sizes; lock sleeves for roller bearings; gibs, gears, sprockets, cam rollers and cams.

Dry anti-friction effects are obtained by various materials with and without graphite particles in the final microstructure. Such effects are desirable for bushings, sliding blocks, pillow blocks, ball joints, ratchets, levers, door latches, rocker-arm bearings and clutch housings.

In most of the applications mentioned so far, both with and without oil impregnation, a perfectly smooth surface finish is an important factor. Such finish requires additional operations in parts made by machining: it is produced without additional expense by the powder-metallurgy process.

Friction Materials

For friction articles as well as for anti-friction effects, powder metallurgy provides materials offering advantageous properties, most of them based upon the incorporation of a nonmetallic (siliceous) friction ingredient. The suitable mixture of powders varies with the service conditions (speed, pressure, temperature) and may require a combination wtih anti-friction effects (addition of graphite) for limiting wear; a small variation of the composition may change the characteristics of the material beyond the range specified for the purpose.

As a rule, adequate strength is achieved by assembling a briquetted layer with a reinforcing member of solid metal. Because of the total pressure involved, compacting problems arise from the large areas of brakes and clutch facings. Hence, these parts are made in segments.

Powder-metal parts can be assembled by the same methods as other metallic parts. If perfectly clean, they can be welded, soldered or brazed. Inserts are best pressed into place after sintering, rather than molded into the part. And if some machining is required on powder-metal parts, no coolant is permissible to avoid internal corrosion by seepage into the pores of the piece and remaining there.

The competitive position of powder metallurgy varies with the application, which involves material specifications, product characteristics, tolerances, manufacturing volume and delivery. On a pound basis the raw materials cost more than those used in cast or wrought articles of similar composition, but there is no waste as a rule. Some scrap is unavoidable with other methods, and represents an economic loss even if recoverable. Machining the part from a forging or casting is thus often more costly on the score of scrap loss alone than making the piece from powder metals. Other part designs make machining expensive, whereas the shape can be produced at one stroke by compacting powders. But tooling up for powder metallurgy operations is expensive and die costs are usually high, which offset low labor charge per piece except on mass production items. For these reasons, powder metallurgy producers believe that their field lies in manufacturing individual designs in large volume, although small lots are acceptable if technical factors are favorable.

Overload Safety Device for Gantry Cranes

BY F. P. MYER

GANTRY CRANES often tip over with resultant loss of life, material and the crane itself for lack of a protective device that prevents attempts to lift the same load with a flat boom as with a "straight stick." Such accidents might be avoided by use of a tub transformer connected to the overload mechanism on the hoist motor.

In the arrangement visualized, the rigidly mounted primary coil of the tub transformer would be energized by the hoist-motor current. On the other hand, the transformer secondary would be connected to a lever or cam mechanism attached to the boom. Arrangement of the actuating mechanism would be such that the secondary coil would be at its maximum travel into the primary when the boom reaches its lowest position.

Under these conditions the secondary coil is at its lowest inductive position when the boom is at its highest point, and thus a high current would be required in the primary coil before sufficient current could be induced in the secondary coil to trip the overload mechanism. As the boom is lowered, the crane's lifting ability decreases inversely with increased radius of the boom's reach. At the same time, the secondary coil of the tub transformer sinks into the primary and maximum secondary current is induced. So, if the load is excessive, the hoist-motor overload mechanism is tripped. What has been described is considered a basic idea and patent application has been made.

AUTOMATIC WELDING
Applied to Large and Small Lots

Experience of two manufacturers proves the process versatile if positioners and fixtures are designed for maximum flexibility

SPEED CONTROL for a rotating positioning fixture makes it feasible to apply automatic arc welding to short-run production items in a wide variety of sizes. Thus, it is possible to obtain uniform, neat-appearing welds that require no special cleaning of slag and spatter.

The positioner, which can be tilted at various angles to effect the most efficient welding position, is rotated by a variable-speed drive operating from an a.c. circuit. The speed control system worked out by Reliance Electric Company makes it practical to apply the Lincolnweld process of automatic welding to virtually all its motor end bracket and frame welding jobs regardless of the number of pieces to be produced. This is accomplished by predetermining the rotating speed of the workpiece.

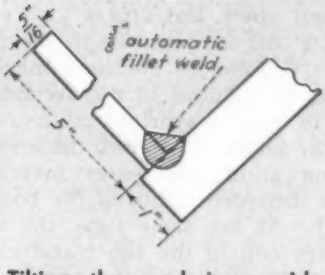
The rotating fixture on which the work is placed is connected to the starting circuit of the Lincolnweld head; when the start button on the control panel is pushed the fixture rotates.

Spindle speed of the positioner is determined by use of a tachometer on the work at the point of welding. Knowing the diameter and surface speeds the operator refers to a previously prepared chart which gives him the revolutions per minute at which to set the machine.

For fillet welding the motor brackets, assembly, consisting of a circular section, 1 in. thick with an outside diameter of 18 in., is positioned adjacent to the ring. The juncture of these two members forms a fillet joint.

The work is tilted under the welding arc so that the joint is flat positioned for most efficient deposition of the weld metal. As the work revolves at a welding speed of 30 in.

The workpiece is mounted on the positioner with the welding head and wire reel supported above. The control panel is on a separate pedestal at the right



Tilting the workpieces aids the formation of a fillet weld in the end bracket assembly

per min., the 5/32-in. welding wire automatically feeds down through the head and forms an arc between the end of the wire and the work. The arc is fully shielded and protected from the surrounding atmosphere by a flow of granular flux deposited on the joint just ahead of the arc. Unfused flux falls into the pan surrounding the work where it can be screened for reuse.

The welding generator, set at 450 amp., effects a weld penetration of about 25 percent of the joint, which results in a strong, neat appearing weld requiring no machining.

Motor-Frame Fabrication

Other jobs handled by the company with the same automatic equipment include the fabrication of motor frames in a variety of sizes. One changeover, for example, was made in the construction of relatively small motor frames measuring only 9½ in. in diameter.

These frames were previously manufactured by press-fitting a ⅜ by 1¼-in end ring in each end of the 5/16-in. thick shell of the frame, then manually welding at the inside joint. After welding, the interior was sandblasted to clean off scale and slag caused by heating.

By simple redesign for automatic welding, a much better joint was formed, and cleaning the interior of the shell was entirely eliminated, resulting in a saving of about a dollar per shell.

With the new design the ¾-in. rings were machined to an L-shape, fitting over the end and inside diameter of the shell. The parts were then clamped in the positioner and butt welded around the outside seam, using 5/32-in. bare metallic electrode. Welding speed is 30 in. per min.

The new process also figures prominently in the fabrication of intermediate and large sized motor frames such as the 20¼-in. diameter size.

The same general design and automatic welding procedure is followed in this case for the asembly of the end rings, the ½-in. shell being chamfered at the joint for easier penetration of the weld metal. The 1½-in. rings are fused to the shell automatically at a welding speed of 25 in. per min., using 5/32-in. bare electrode. The longitudinal ribs are manually fillet welded to the shell with shielded arc electrode of American Welding Society specifications, E-6030.

Another example of automatic welding involved the volume manufacture of centrifugally cast bearings at the Cleveland Graphite Bronze Company, where its use has greatly simplified operations and made possible the production of uniform welds of consistently high quality.

The welded bearings, made by this concern consist of SAE 1010 or SAE 1020 forged steel with inside diameters ranging from 4 to 24 in. They are subjected to 2,300 F. during casting of the molten bronze bearing metal.

Held by Peening

In preparing for welding prior to casting, a ⅛-in. thick disk is placed in the end of the shell, thus forming a butt joint. The disk is held down by slightly peening the edge of the shell over the disk, using a center-punch.

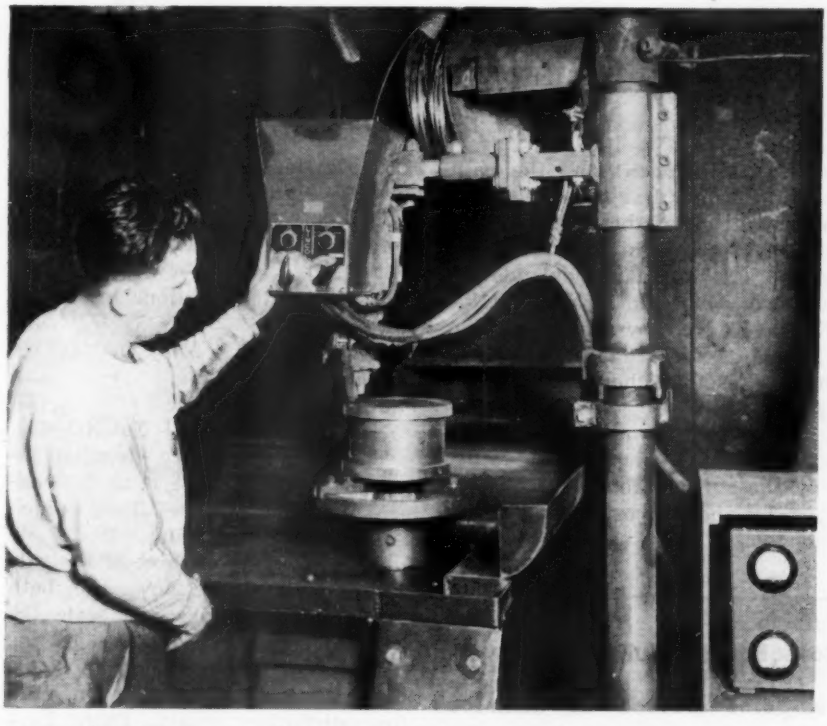
The assembly is then placed on a rotating fixture where it is positioned by means of three adjustable jaws located on the top of a variable-speed, motor-driven spindle.

The Lincolnweld head, flux hopper and arc control panel are mounted on a special jig. The automatic control box is located at the right of the jig within easy reach of the operator as shown in this view.

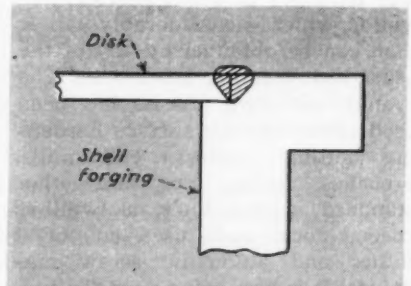
The welding head is swiveled on the jig and can be raised or lowered to accurate welding position over the joint. It is held stationary in this position while the bearing rotates, automatically depositing a granular flux ahead of the arc so that the welded bead is entirely shielded and protected from the atmosphere.

Automatic welding of a ⅛-in. disk to the end of a 8-in. diameter bearing using 5/32-in. electrode with 400 amp. and 28 volts requires approximately 29 seconds. Then exact amounts of bearing materials are placed into the container preparatory to welding the final ⅛-in. disk.

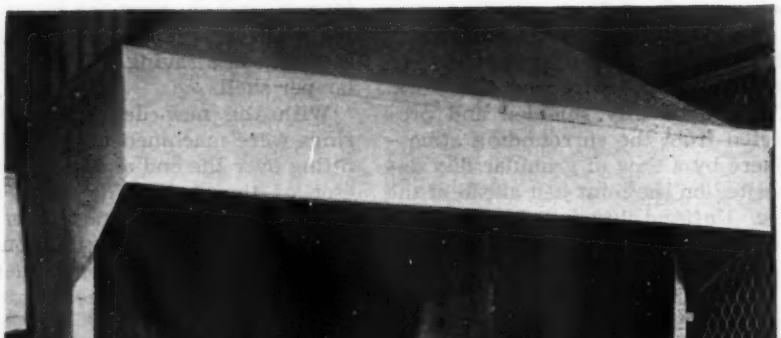
After casting the bearing, the disks are removed by cutting away the weld metal at the seams.



Bronze bearings are made by placing the bronze inside a steel case and then welding the case closed. The case is then placed in a furnace and spun at high speed, casting the metal around the inside circumference of the case. The whole piece is then cooled down and the outside machined away to leave a bronze bearing



A sectional view indicates how the steel disk is butt welded to the end of the shell prior to casting centrifugally



Cutters normally are suspended with carbon steel wires from a support rod laid across the pot of the Holden cyanide salt bath nitriding furnace. The furnace pot is carefully hooded for the safety of the operator. Small taps, drills, reamers, gage parts and similar items difficult to suspend from a rod with wire are placed in a carbon steel wire mesh basket for immersion in the cyanide salt bath furnace

CYANIDE NITRIDING

Increases Hardness of High-Speed Cutting Tools

BY JOHN E. LYNCH AND CARL W. SNYDER
SAN DIEGO DIVISION, CONSOLIDATED VULTEE AIRCRAFT CORPORATION

HARD SURFACING of high-speed steel cutting tools by cyanide nitriding has, in many instances, materially increased the effective life of these tools between resharpenings at the San Diego plant of Consolidated Vultee Aircraft Corporation. This additional treatment on hardened high-speed steel tools creates a surface hardness of about 70-75 Rockwell C, which is considerably harder than can be obtained by any of the usual heat-treating procedures. The cyanide nitriding process has been used effectively for surface hardening milling cutters, end mills, broaches, drills, taps and other standard cutting tools, as well as special form tools used on turret lathes and automatic screw machines. It is also being used for surface hardening gage parts made of high-speed steel.

When high-speed steel is immersed in molten cyanides at 900 to 1,100 F., the resulting increased surface hardness is caused by the absorption of nitrogen from the bath to form more or less stable nitrides. The chemistry of the nitriding salt bath involves the oxidation of the sodium or potassium cyanide to sodium or potassium cyanates (NaCNO or KCNO) by the application of heat and exposure to the air (oxygen). Two sets of chemical reactions may be considered, one occuring at the surface of the molten salt bath exposed to the air and the other from the subsurface reactions catalyzed by the immersed high-speed steel tools.

Consolidated Vultee employs a five-point method of chemical treatment which augments the regular hardening processes

The surface reactions are as follows:

$$2NaCN + 0_2 = 2NaCNO \quad (1)$$

$$4NaCNO + 3O_2 = TNa_2CO_3 + ACO_2 + 2N_2 \quad (2)$$

The sub-surface reactions are as follows:

$$4NaCNO + 3O_2 = 2Na_2CO_3 + 2CO_2 \; CO + N_2 \quad (3)$$

$$2CO = CO_2 + C \quad (4)$$

$$NaCN + CO_2 = CO + NaCNO \quad (5)$$

The most effective reaction is equation (3) because it is the nascent nitrogen released here which is available for nitriding.

If the cyanide content of the nitriding bath is too low, the bath tends to decarburize and scale the tools. The cyanide content of the nitriding bath, therefore, must be maintained at 15 percent or more for satisfactory results. Baths having a cyanide content of 24 to 28 percent seem to work well. Temperature of the bath must be controlled carefully, as the higher the temperature, the more rapid process

and the more brittle the hard case.

The nitriding potential of a cyanide nitriding bath is determined by a number of factors, such as: (a) cyanate (CNO) content, (b) surface condition of the tools to be nitrided, (e) nickel content of the bath, and (d) temperature control.

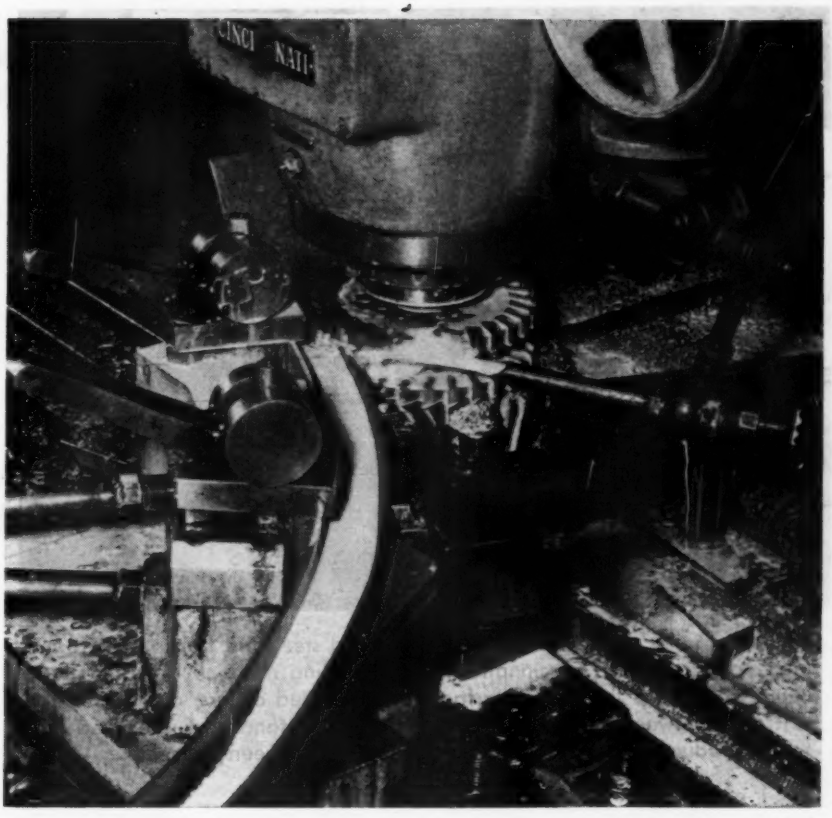
Baskets, thermocouples and pots used in the cyanide nitriding process should be made from low carbon steel. If nickel alloy steel is used for this equipment, it will be dissolved by the bath and plated on the tools being treated, thus retarding the nitriding process.

The depth of the case should vary from 0.0005 to 0.003 in., depending on the type of tool. Approximately 90 percent of the tools given this treatment thus far at the San Diego plant have been given under 0.001 in. depth of case to insure against brittleness. The surface hardness of the case is approximately 70-75 Rockwell C. This produces an extremely hard, wear resistant surface on the tools.

The depths of case obtained by immersing high-speed steel tools in a nitriding bath at 1,025 F. are as follows:

Time in Minutes	*Depth of Case in Inches*
15	0.0005
30	0.001
45	0.0015
60	0.0017
120	0.0025
180	0.00325

The cyanide nitriding process can be applied to conventionally heat-treated high-speed steel tools purchased from vendors and stocked in toolcribs, as well as to those manufactured in the plant. Where the tools are subject to shock loading in use, or where the design of the tool is such that a relatively soft core is desirable, the tools can be drawn to a hardness as low as 42-48 Rockwell C to give a tough core, then nitrided to develop a hard outer case. The process seems to work equally well with tungsten (18-4-1 and 18-4-2 types) high-speed steels, molybdenum high-speed steels and 5 percent chromium die steels.



Outer surfaces and edges of flap track forgings are milled by nitrided cutters at speeds higher than would be possible with high-speed steel tools heat-treated in the conventional manner. In every case, these cutters are flooded with coolant

The nitriding of annealed tool steels is not considered good practice, as no support is provided for the cutting edge, unless the case is relatively thick and, therefore, somewhat brittle. However, when hardness is drawn to 42-48 Rockwell C sufficient support is provided for the hard, keen cutting surfaces

CYANIDE NITRIDING TREATMENT

Procedure at the San Diego plant follows:

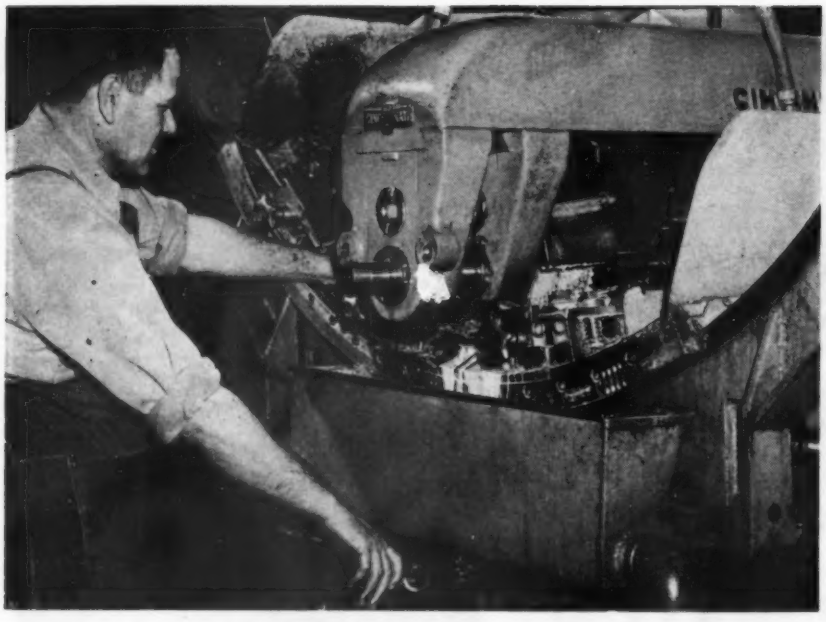
1. The conventionally heat-treated high-speed steel tools are preheated slowly (to prevent cracking) to a temperature of 800 F.

2. The preheated tools are immersed in a cyanide nitriding salt bath and soaked from 15 to 60 min., then are removed from the bath and cooled in air to a temperature of 150 F. Small drills and taps are placed in a wire screen basket for immersing in the salt bath, larger cutters and other tools are wired to a support rod which is hung across the top of the pot.

3. While the tools are at a temperature of approximately 150 F., they are washed in hot soda water at 150 F., rinsed in clean, hot water and dried.

4. The tools are next tempered for one hour at 1,000 F. in a nitrate salt bath. This tempering treatment relieves nitride brittleness and inhibits atmospheric corrosion.

5. They are finally cooled in the air to atmospheric temperature and cleaned by washing in hot soda water at 150 F., then rinsed in clean, hot water and dried.



Milling the inner surfaces and edges of forged steel flap tracks is performed on a standard No. 3 Cincinnati knee-type milling machine, using a special fixture to produce the curved surface. With nitrided cutters, output averages 30 tracks between tool sharpenings while with standard high-speed tools production averaged only eight tracks between sharpenings

made possible by the nitriding process. The cyanide nitriding process does not seem to produce as brittle a surface as produced by the ammonia process, and the line of demarkation between the nitrided case and the core is not as sharp. In the case of the light, delicate tools where distortion is a problem, it is possible to heat-treat the tools in the normal manner, cool them in the air, then draw and nitride by this process.

Among the outstanding applications of high-speed steel milling cutters given a hard surface case with this process are those used for milling heat-treated SAE 4130 chrome - molybdenum steel flap track forgings for the B-24 Liberator and PB4Y-2 Privateer bombers. These curved tracks must be milled all over. In the first setup for milling the inner surface and the edges of the flap track, a nitrided high-speed steel slab milling cutter and two nitrided side mills average 30 tracks per tool sharpening, with a maximum of 42 tracks. When using high-speed steel cutters heat-treated in the normal manner, but not nitrided, the average was eight tracks per tool sharpening. The use of nitrided cutters on this operation permits increasing speed and feed rates to load the cutters to the maximum possible. The 3-in. diameter slab cutter and the two 5-in. diameter side mills are operated at 27 r.p.m. with a feed of 2⅛ in. per min. Depth of cut is about ¼ in. at the center of the forging.

In another operation on these flap tracks, the two opposite sides are milled with opposed nitrided end mills in a Cincinnati double-head manufacturing type milling machine using 1⅛-in. diameter cutters with ⅛-in. radius on the ends of the teeth. With standard high-speed cutters, production average was six to eight tracks between cutter resharpening. When these cutters were nitrided, the production was increased to 20 to 23 tracks per cutter set-up, with a maximum of about 27 tracks.

Some drills, taps and reamers have been nitrided to advantage for the more difficult operations on aluminum alloys and steel parts. Nitrided taps have been found to hold size better than regular high-speed steel taps when tapping small holes in duralumin parts. In some of these operations, untreated taps were affording 100 tapped holes, but now the average ranges between 175 and 200 holes with nitrided taps. The nitride treatment has been found to increase the number of cuts between grinds of conventionally heat-treated high-speed steel tools from 1½ to 6 times. When nitrided drills and taps break, it has been found that breakage usually results because the drills were brittle before nitriding, not necessarily because of brittleness caused by the nitriding.

Air Gages Speed Inspection—Discussion

BY DONAT A. GAUTHIER

IT IS NEWS to me that pneumatic gages were originally developed in Australia, as stated in a recent article by W. J. Hargest. Basic patents on air gaging were taken out by Soc. An. Solex of Paris, with American applications starting in 1929. While air gaging can be obtained outside the Solex patents, some of the essential features of any air gage, low or high pressure, have not yet, to my knowledge, been made available by means other than those described in the Solex patents. And I speak from a study of the subject since 1931, and am still manufacturing and developing air gages and accessories.

While in the case of Solex, patents are not necessarily a proof of origination, there is no doubt of this concern's contribution to the art. Of course, other people had observed the general relationship between air pressure in a chamber receiving it from a constant-pressure source through a fixed orifice, and bore size acting as a metering medium on escape of air to atmosphere. But Solex was the first to investigate the influence of several factors: temperature, barometric pressure, air humidity, recessing of plug jet tips and need for close pressure regulation.

In this article, Mr. Hargest illustrated a low-pressure gage in which constant pressure is obtained by water. This scheme corresponds with Solex construction developed prior to the war. Possibly someone in Australia has been all through the subject long before the French company, and if so I should like to know the details.

Practical Ideas

HAVE YOU A PRACTICAL IDEA?... If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. We pay for acceptable contributions prepared exclusively for this publication

Armature Pivots Polished Without Removing from the Armature

BY JACK C. BROWN, PENSACOLA NAVAL AIR STATION

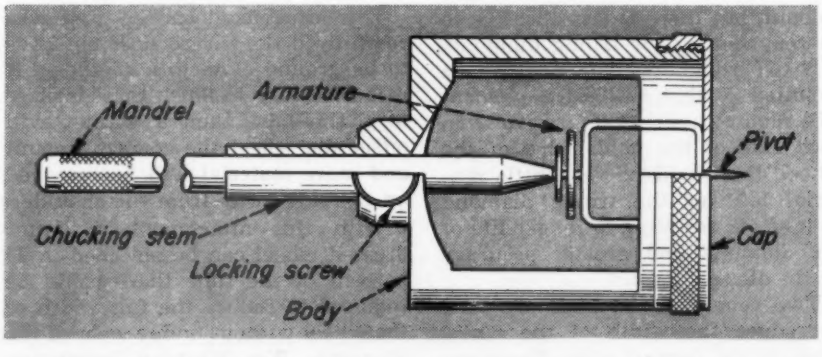
Due to the minute size of small instrument armatures, polishing pivots on the shafts presented a real problem. It was customary to discard them rather than to make the necessary repairs.

A fixture was made to hold the armature in such a position that either the pivot could be polished in place or a badly worn one removed and another put in its place.

This fixture consists of a frame with a round stem capable of fitting into a collet. The stem was drilled to pass a mandrel whose end was drilled to fit the armature shaft. The mandrel can be adjusted to any position in the frame and held there by a thumbscrew. On the outer end of the frame is a screw cap with a hole through its center large enough to fit the armature shaft.

To polish or repair pivots, the armature is placed in the frame with one end of the shaft in the mandrel, then the cap is screwed on the frame. This permits one pivot to project beyond the cap. The assembly is chucked in a small lathe. If the pivot must be replaced, pliers are used to pull the damaged point; if polishing is necessary, the lathe is started up and the worn surface polished with a stone.

With this small fixture, many armatures were reconditioned and returned to useful service; very few were discarded. Armatures with removable pivots were repaired with little possibility of damaging the armature. *Suggestion submitted under the Navy Employees' Suggestion Program.*



A frame, chucked in a lathe, holds the armature securely while a pivot is polished or a badly damaged point is replaced

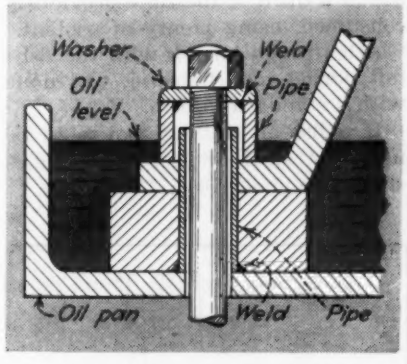
Simple Welding Operation Stops Leakage from Oil Pans

BY FREDERICK W. EDELE
Winchester Repeating Arms Company

A serious condition of long standing existed at a number of radiator-tube extruding presses in this plant. Oil constantly drips from these machines because the tubes must be bathed in oil. Each machine rests on steel blocks set in an oil pan through which the anchor bolts must pass.

The oil seeped through the holes in the pan around the anchor bolts and soaked through the foundations. In addition to creating a fire hazard, the oil made a messy basement even though it was cleaned weekly. Various efforts to seal the pans with a packing around the holes had failed.

The leakage was stopped by cutting short sections of pipe with a diameter to fit loosely around the anchor bolts and with a length slightly less than the inside depth



A short section of pipe welded to the base of the oil pan stops leakage of oil around the anchor bolts

of the oil pans. These pipes were placed over the holes in the pan and welded to the pan.

The steel support blocks for the press feet were drilled to fit over the short pipes. A section of pipe of slightly larger size than the first piece was fitted over it and a heavy washer was welded to the top. When the nut is placed on the anchor bolt, the cap thus formed holds the machine down and also keeps oil splashing into the inner pipe.

This simple arrangement has eliminated the seepage and resulted in a saving of large quantities of oil, avoided frequent foundation replacements, and has eliminated the cleaning job. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Fishtail Mill Machines Alloy Bronze Castings Quickly

BY SAM BENDICK

Recently, it was necessary to machine several hundred tough alloy bronze castings. The operation was to finish to size a deep cored pocket.

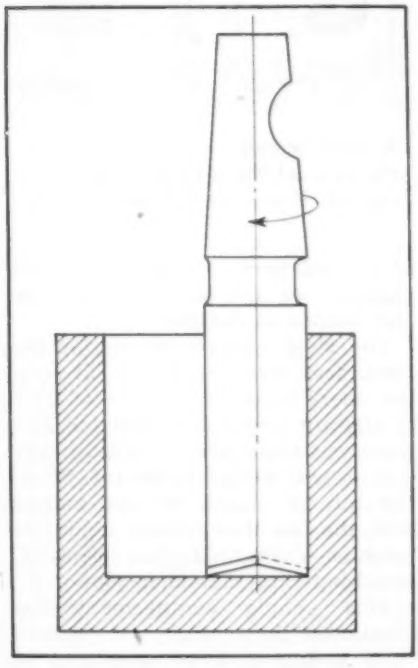
Trouble developed when the corners of the pocket were being roughed out. A standard 1 in. x 3½ in. four-flute, high-speed end mill was used. This tool would grab and break off at the shank. Mills of larger and smaller sizes were tried without success. If the mill did not break, the tool would be operating at too slow a rate, using too much time.

Finally, one of the 1 in. x 3½ in. mills was converted to a fishtail mill by grinding the cutting edges to a 15 deg. angle for both horizontal and vertical anges on the face mill.

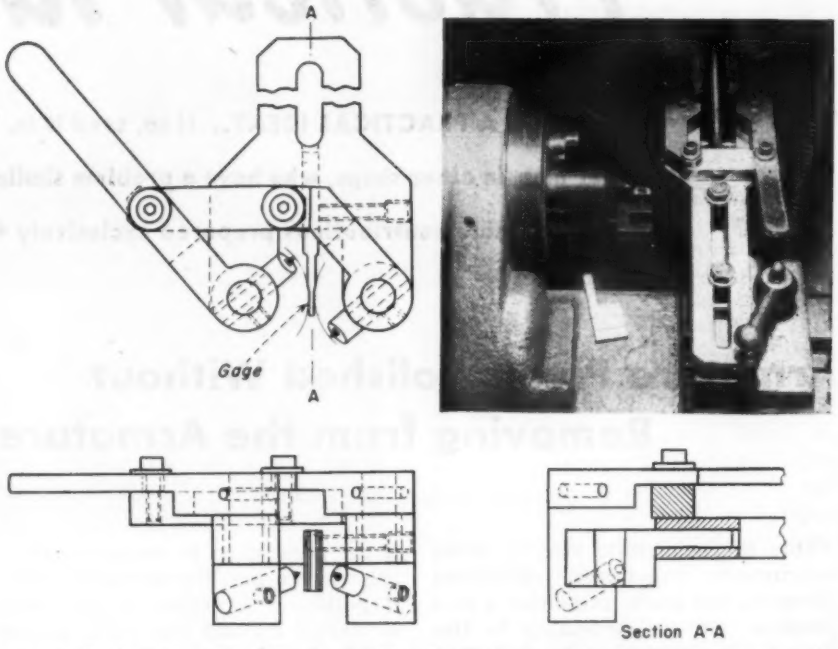
With this milling cutter in a vertical milling machine, the corners and sides of the pockets were milled out in a third of the time previously consumed, using plenty of coolant.

After rough boring with the fishtail boring tool, finishing was done with a standard mill.

If a fishtail milling tool is to be used for steel or iron, the angles should be about 10 or 12 degrees.



A fishtail mill cutter roughed out tough alloy bronze castings rapidly where the conventional cutter either broke or consumed too much time to remove the metal



A rough dressing attachment, readily placed in position, takes off material from each side of wheel and leaves very little for the finishing diamond to remove while forming the cutting edge

Wheel Dressing Attachment for External Thread Grinder

BY MARTIN LA CHANCE
The Amertorp Corporation

For grinding external threads, the abrasive wheel is many times wider than the thread. Dressing this width of wheel requires considerable time and wears the truing diamond, destroying the accuracy of the cutting edge, thus producing an unacceptable product. A narrow wheel, slightly wider than the width of the thread, is not likely to run true because it may wobble or run off to one side while smoothing due to the feeding pressure on one side of the disk. Thinning the outer edge of the wheel for a short distance with a roughing dresser diminishes the stiffness of the wheel only a slight amount, but there is less abrasive to be removed by the truing diamond.

If two roughing diamonds can be mounted so that a slight movement will remove a strip of abrasive from each side of the outer edge of the wheel, there will be very little material left for the truing diamond to take off, resulting in longer life of the diamond and greater accuracy of the thread form.

Two roughing diamonds are used to reduce the width of the wheel close to the formed edge. These are mounted in holders capable of rotating about vertical axes. The holders are connected through linkage operated by a handle. When the handle is moved one rougher moves inward while the other moves outward. The attachment is fastened to the bed of the machine and can be adjusted according to the wheel diameter.

To align these roughing diamonds, a gage, made to the desired thickness of the rim, is held in position by a setscrew. To set these diamonds, the gage is placed in position, then the diamonds are put in their holders. Each diamond is brought into contact with the gage and its setscrew tightened. With the diamonds centrally located from the gage, the same amount of material is removed from each side of the wheel. After the diamonds are locked in position, the gage is removed and the wheel placed on the spindle.

This attachment can be used successfully if the thread does not have to be ground close to a shoulder. If it is necessary to finish threads close to a shoulder, then a washer will offset the wheel the correct amount and more material will be removed on the side away from the shoulder.

With this attachment, a better dressed wheel can be obtained in 25 percent of the time than would be required to reduce the full width of the wheel without undue wear of the diamond. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Precision Toolholder for Turning Inside and Outside Curves

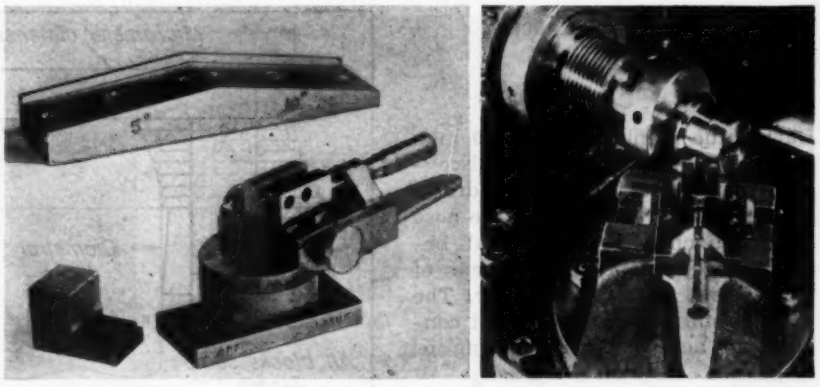
BY LUDWIG A. ZINK

Packard Motor Car Company, Marine Engine Division

Small radius curves, whether inside or outside, are rather difficult to hold to size, because formed cutters soon wear and grinding only aggravates conditions caused by change in dimensions due to cutting tool clearance. In addition to this trouble, it is difficult to grind individual tools to close tolerances.

A precision toolholder was designed which could be pivoted about a bearing. It consisted of a bed which could be attached to the compound rest of a lathe. This bed carried a rotating base which was gibbed for a slide to support the cutting tool: the rotating base could be turned by a handle projecting from the back. On each side of the gibs are thumbscrews for locking the toolslide in position once adjustments of the toolslide have been made for a cut. The toolslide is grooved for the tool and has setscrews for fastening the cutters in position. Behind the toolslide and attached to the rotating base is a micrometer barrel and its spindle.

To prepare for operation, the bed of the toolholder is bolted to the compound rest of a lathe, the toolslide is moved until it is against the micrometer spindle and locked in position with two thumbscrews. Then a toolbit is inserted in the toolslide. A setup block is used which rests on the rotating base so that, when the cutter is moved into contact with it, the point is at the center of rotation, after which the setscrews in the toolblock are tightened to hold the cutter in this position.



Accurate fillets and rounded corners can be turned in quantity by the use of a swiveling toolpost equipped with a micrometer adjustment. Formed tools can also be ground to the proper radius with relief angles by using the 5 deg. and 7 deg. angle block

After the cutter has been positioned, the thumbscrews are released and the micrometer spindle turned forward or backward. Forward movement will cut a fillet while backward motion will turn an outside curve to round off a corner. With the micrometer barrel divided into thousandths or ten thousandths of an inch, very accurate fillets and rounded corners can be turned out in quantity. The micrometer movements are for the radius of the curve to be made.

This attachment replaces the regular toolpost on a lathe. The carriage can be moved to any position along the bed and the cross-slide must position the cutting tool at the dead center at either end of the curve. This fixture can be used for turning ball and socket joints by placing the tool on the dead center of the lathe.

In conjunction with the angle block, shown with 5 deg. and 10 deg. slopes, this device can be used to grind a radius on forming tools with clearance angles simultaneously.

The use of this tool arrangement reduced the machining time 40 percent in addition to doing away with grinding a variety of toolbits. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Brass-Faced Removable Liners Clamp to Vise Jaws

BY EDWARD DISKAVICH

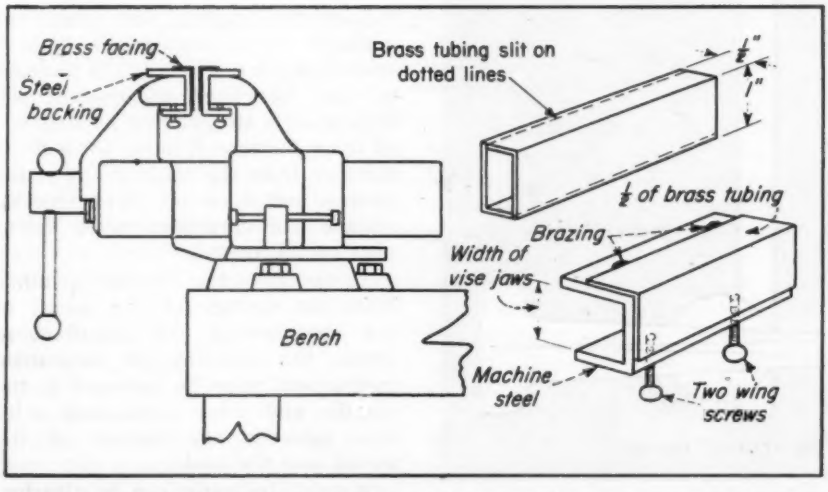
The customary soft metal liners fit on the top and sides of the vise jaws. The greatest problem has been to make them stay in place when they are in constant use.

By brazing brass to soft steel channel-shaped liners and using setscrews to hold the liners to the vise jaws, there is no time lost replacing liners.

Machine steel bar stock is shaped out to form a channel deep enough to fit over the thickness of the vise jaws, but the legs are wide enough to take set or thumbscrews.

For convenience, a piece of rectangular brass tubing of the proper depth and width is cut so that two angles result. These pieces are brazed to the working face and top of the steel channel.

The brass jaw faces do not curl from use, they are held positively, cannot shift position and do not scar delicate work.



With this arrangement, no time is lost replacing the liners every time the vise jaws are opened

Sliding Plate Gage Checks Punch Nose Profile

BY JOHN F. CAVANAGH, JR.

During the manufacture of 40 mm. steel cartridge cases, it was discovered that, through successive drawing operations, the shape of the nose of the punch was very critical, because it was composed of a series of curves and a diametral taper. The usual profile templets were not consistently accurate for grinding or inspection.

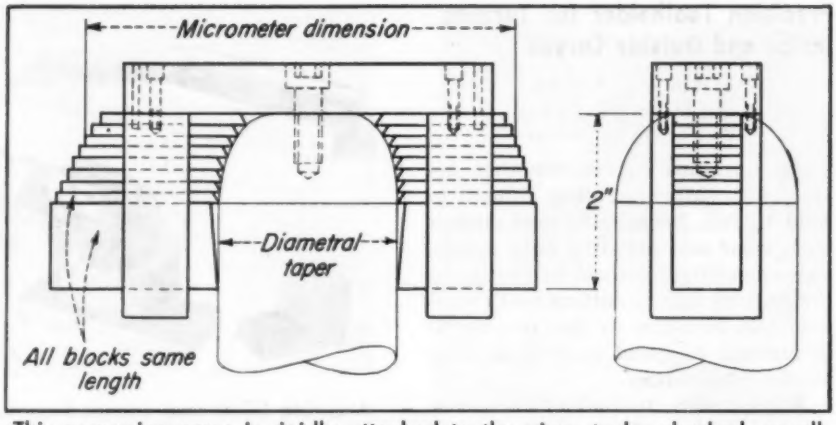
The gage developed for an accurate check of the contour consists of a series of sliding plates contained in a holder. The plates were hardened, then ground all over; the outside end of each plate was square, the other was slightly beveled across the thickness. For convenience, all plates were made the same length; those plates used to measure the base diametral taper are thick, while the others which follow the curvature are thin.

All of these plates are contained in a holder which supports groups of these plates on each side of the punch nose. These holders are attached to a bar by dowels and screws. The bar has a counterbored hole to take a socket-head screw with a snug fit at the body. All parts are ground to size.

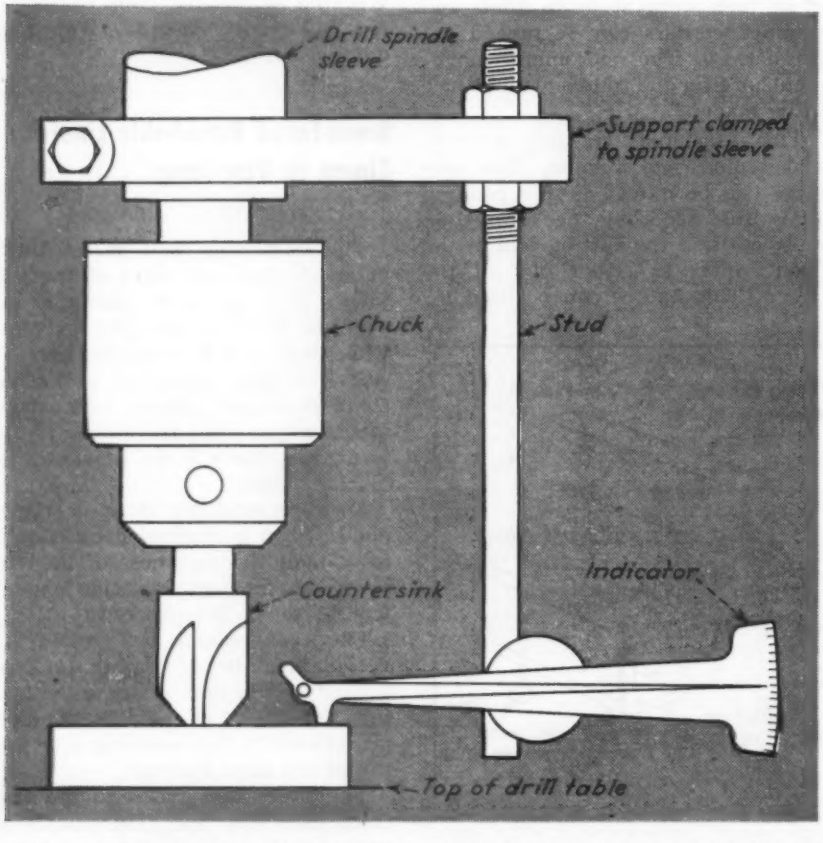
The holder is mounted on the punch nose by tightening a socket-head screw through the holder bar into the tapped hole in the punch.

After the holder is firmly in position, all the plates are moved into contact with the punch. Because each plate is exactly 2 in. long, all dimensions measured by the micrometer are 4-in. larger than the actual dimension on the nose. The bottom-plate is equal in thickness to the length of the diametral taper, beyond this thick plate are a series of plates of equal thickness. All these measurements are checked against computations for the numerous points established by the plate contour gage.

This type of gage can be used to check punches within its range with the assurance that the dimensions obtained from the punch are accurate.



This measuring gage is rigidly attached to the piece to be checked, so all measurements are accurate. Each plate is in contact with the contour which means step by step checking



Distance between the depth of the tool and the surface of the metal is always shown by an indicator fastened to the drill spindle sleeve

Micrometer Indicator Measures Counterbore or Countersink Depth

BY V. C. BOYDSTON
Chief Engineer, Doran Company

Correctly gaging the depth of counterbore or countersink from a smooth surface, even if it is finished to size, has been guesswork; the drill spindle stop cannot be depended upon because it is set for a fixed distance from the table to the countersink and does not make any allowance for variations in the thickness of the metal.

To indicate the correct distance from the surface of the metal to the countersink or counterbore depth, the indicator or measuring instrument must be fastened to the spindle and show a constant relation between the surface of the metal and the tool.

A small indicator can be attached to the drill spindle sleeve and supported by a long stud to reach to

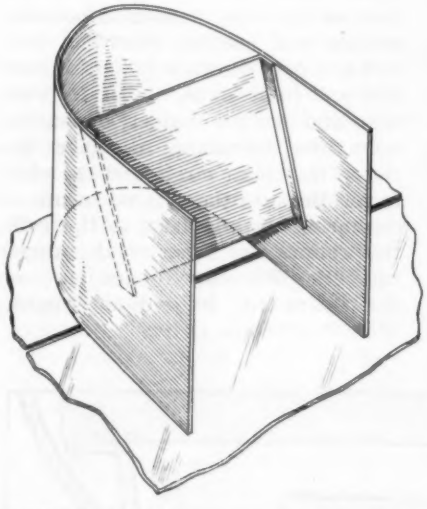
the surface to be worked upon. On the end of this stud is fastened an indicator which must touch the surface very close to the tool. By adjustment, the gage can be made to read zero when the correct depth has been reached. With this indicator, correct distances can be repeated regardless of variations in thickness.

Light-Metal Shield Directs Fumes Away From Welder

BY H. L. CAMOS
Delta Shipbuilding Company, Inc.

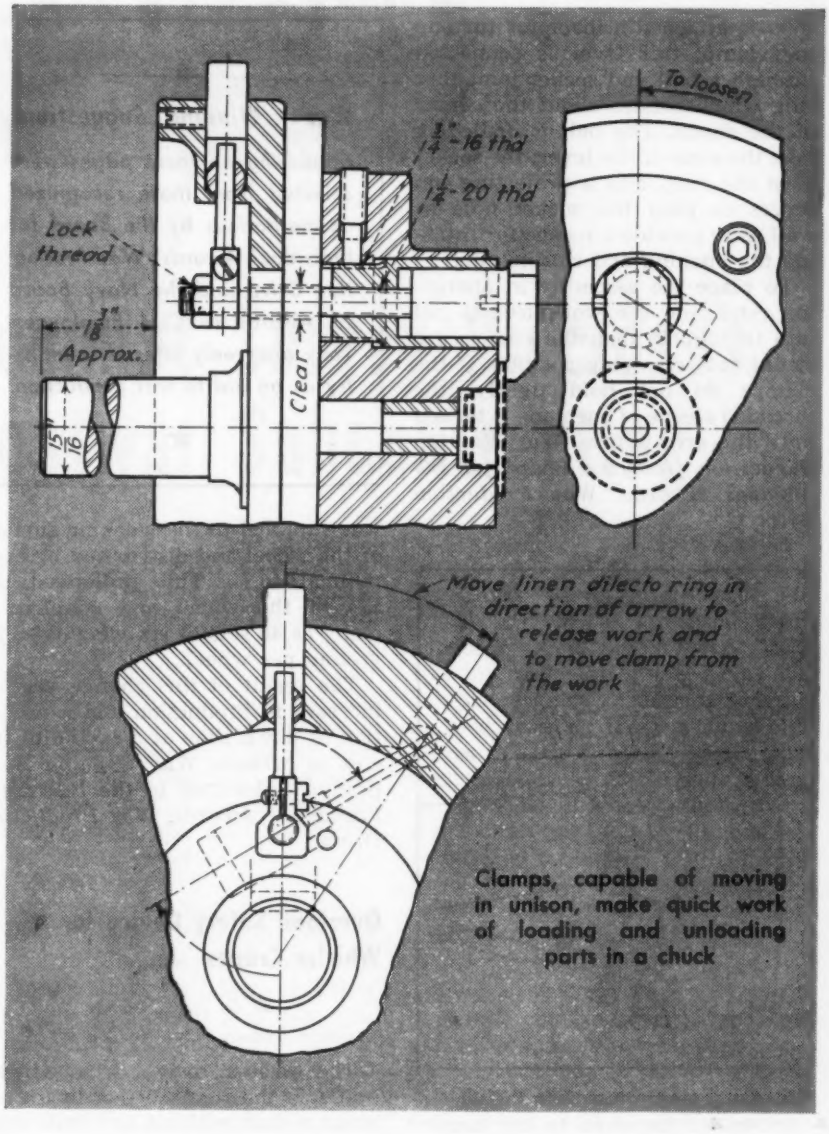
A light semi-circular shield can be used by welders on flat work to protect them from the fumes that are created. The shield is made of light sheet metal and has a diagonal piece extending across the center. This piece, which is fastened to the sides of the shield, creates a draft which directs the fumes out of the front of the shield and away from the worker.

Slots are cut on each side of the semi-circular section so that it can be placed over angular work. Small flaps held loosely by a single bolt fit over the slots and close them when not in use.



Welding fumes are caught by the draft created through this shield and are expelled away from the welder by the diagonal plate

In addition to protecting the welder from fumes, the shield keeps welding flashes and flying slag from disturbing or injuring other workers in the vicinity. *Suggestion Submitted under the Navy Employees' Suggestion Program.*



Clamps, capable of moving in unison, make quick work of loading and unloading parts in a chuck

Automatic Clamping for Quick Loading and Unloading Chuck

BY NORRY M. MEAD
International Business Machines Corporation

Clamping small pieces in a chuck for secondary operations, especially where the article can be centered in the chuck, is a time-consuming operation if each clamp must be adjusted individually.

A way out is to make a chuck with quick-acting clamps which rotate simultaneously when opened or closed. The principle is to use clamps which can be rotated into and out of clamping position, yet grip or release the article with the movement of an actuating ring.

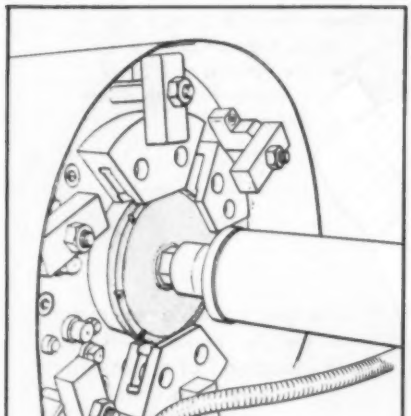
A faceplate has a number of stations located upon it, depending upon the shape and size of the piece. Threaded sleeves are placed in these stations; the threaded part entering the faceplate should have a different pitch from that of the clamp screw; if both threads had the same pitch, movement of the sleeve would not change the position of the clamp inward or outward, but with different thread pitches the adjustment amounts to the difference between the thread pitches.

The faceplate is bored to take a sleeve for holding the workpiece. If a large number of pieces are to be made, a hardened steel bushing should be used.

The clamp has a jaw big enough to hold the piece firmly in position, and the shank has a large diameter to give bearing surface and stability, while the threaded stem is smaller in diameter, because it resists tension and turning. On the end of the

stem is attached a lever for turning the clamp; this lever is connected through a ball and socket joint to a ring which rotates about the center of the chuck. The ball is drilled to take the stem of the lever; the socket is in the ring, and a projecting pin serves to plug the socket hole as well as to provide a means for rotating the opening and closing ring.

To place the assembly in operating condition, the workpiece is put into the chuck, then the clamps are swung into clamping position. If the clamps do not hold tightly, the threaded sleeve of each one is turned until the grip is firm. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Use of coolant grooves in the wheel rim caused the wheel to last longer and increased production

Grooves in Grinding Wheel Rim Increase Active Life

BY LEOPOLD P. MOCHAN
Marine Engine Division,
Packard Motor Car Company

With a grinding wheel having a continuous rim surface for grinding the inner faces of grooves, great difficulty was experienced holding these parts to size, due to the lack of coolant. The ground surface burned and the rim became undersize, which meant constant replacement of wheels. The set-up was to mount six counterweights on a faceplate at once, then grind the inner faces to close tolerance.

By cutting coolant grooves about ⅛ in. wide by ⅛ in. deep in the sides of the rim, plenty of coolant was supplied to the working surface of the wheel and distributed by centrifugal force. This prolonged the life of the wheel and enabled as many as 40 sets of six weights to be ground per wheel.

The result of this change was an increase in production and a reduction of down time at a saving in the cost of wheels. *War Winning Suggestion Submitted to the Board for Individual Awards, War Production Drive.*

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War - Winning Suggestions

appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive and the Navy Board of Awards to Civil Employees. They are freely offered to industry as an aid to war production.

★

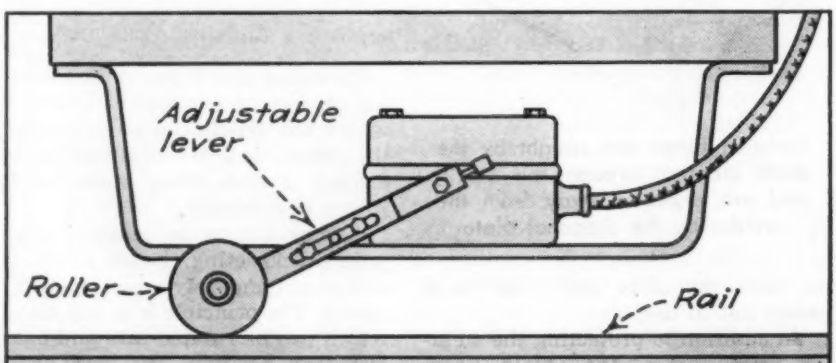
Overload Safety Device for Whirler Cranes

BY G. F. MORGAN
Kaiser Company, Inc., Vancouver, Wash.

The greatest danger from whirler cranes is the possibility of lifting too great a load without any indication of it being beyond the safe capacity of the crane. The counterweights are designed for a certain load and cannot take care of more than that amount. Due to the crane revolving on rollers, there is nothing to hold the moving mechanism to its base, the kingpin serving only as a locating device without much holding power against a vertical lift. The danger from overloads is attested by the tip-overs which have practically wrecked valuable pieces of machinery and injured their operators.

An electrical device, modified from a circuit breaker, has been applied between the platform and the roller circle of a whirler crane so that, when the load is normal, a green light shows in sight of the operator; when the load is up to 40 percent of capacity, amber lights burn; when the load has reached the danger point, the red lights go on.

The foregoing indications are controlled by the amount of forward tilt of the cab, which affects the distance between the frame and roller track. The modified circuit breaker box is placed on the back of the platform where the greatest amount of tilt occurs as the load increases. A roller arm from the circuit-breaker box is always in contact with the lower roller circle; as the tilt increases, the lever deflection becomes greater and another electrical contact is made, showing green for normal and light loads, amber for caution, and red for danger, depending upon the increasing distance between the roller circle and the platform. Because there is no means of anchoring the platform to the rails, the rollers are free of the upper rail. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Overload safety device, made from an altered circuit breaker, warns the operator of the amount of load the crane is handling

RECONVERSION

SECTION OF AMERICAN MACHINIST

American Machinist Survey Discloses Trend of Postwar Subcontracting

Thousands of small shops are wondering how much subcontracting business they can expect to do after the war. To get at the facts, American Machinist asked the McGraw-Hill Research Bureau to make personal calls upon prime contractors with thousands of subcontracting relationships. The results, forecasting the postwar trend of subcontracting, are herewith disclosed

SIXTY-ONE PERCENT of the war prime contractors will do less subcontracting after the war than during the war, according to the results of a survey made by the McGraw-Hill Research Bureau exclusively for AMERICAN MACHINIST. Twenty-two percent will do about the same amount of subcontracting as in wartime, 10 percent expect to do more, and seven percent have not made definite decisions.

Some 51 percent of the prime contractors plan to subcontract about as much work after the war as in prewar days. Of the balance, 17 percent will do more, 17 percent will do less, and 15 percent do not yet have definite plans made. As against prewar practices, the survey reveals a change in subcontracting policies of at least 34 percent of the prime contractors, and a possible change of policy on the part of another 15 percent.

The changes from prewar subcontracting stem largely from the experiences, pro and con, learned by companies that before the war had never done any subcontracting, and from the many new industrial relationships arising from wartime subcontracting arrangements.

Of those planning to do less subcontracting postwar than now, only eleven percent say it is because they are dissatisfied with subcontracting. Of the balance, 47 percent expect to handle the business themselves because of expanded facilities or an expected decline in the volume of certain business; the end of war work will terminate subcontracting for 12 percent; nine percent of these primes will return to their peacetime work, thus shifting to a smaller volume of subcontracting; the subs of nine percent will discontinue their relationships postwar to go into new businesses or undertake other subcontracting work; while the remaining 12 percent did not specifically explain their expected reduction in subcontracting.

With respect to the pros and cons of subcontracting, the factor of cost seemed to be upermost in many contractors' minds. Of those stressing this point, 67 percent said that subcontracting cost them more than if they did the work themselves, 25 percent said it cost less, and eight percent said it cost about the same. However, most of those referring to the average higher cost of subcontracting indicated that some of their subs were able to give them items at lower cost than they could make them in their own shops.

For example, one contractor said, "On the whole, costs have risen 10-25 percent due to subcontracting. One specialist sub can do certain work for us 25-50 percent cheaper." This is a wide divergence in subcontracting costs. But numerous primes complained that subbing had increased costs all the way up to 100 percent, and some predicted that such charges would decline postwar as a result of greater competition. One contractor said a sub had received $40 for a part that could be made for $3.69, and expressed the opinion that "Some subs let costs run high to make more profits at the 12 percent margin allowed."

Some executives were very bitter over high charges of some subs. One official of a wartime prime contractor said, "Charges are exorbitant. We have to pay them because there's nothing else we can do. Subcontracting is terrible. If our business gets larger than we can handle, we'll turn down orders before subcontracting." Another company's spokesman was more philosophical: "Subcontractors have been able to charge abnormal rates during the war, because primes have been looking for them. Postwar, things will be different."

Various reports indicated that there are some instances where larger costs are probably explainable by the need for speed, lack of proper facilities and lack of experienced help. As one executive put it, "A shop with one type of equipment might be justified in charging three times what another with more suitable machinery would. The problem has

Prime Contractors' Report on Pros and Cons of Wartime Subcontracting

PROS

	PERCENT OF TOTAL MENTIONS
1. Subcontractors make parts we can't make	22.9
2. They aided us to increase output	20.8
3. They helped us to avoid overexpansion	16.0
4. Their costs are lower	13.2
5. They help you meet your schedules	5.6
6. They help you out in an emergency	4.9
7. Their close location is an advantage	4.8
8. Others: They gave us new ideas and helpful information; they have lower overhead; subcontracting spreads the work; they have less labor trouble; subcontracting permitted utilization of nation's small plant capacity; it offers you a yardstick to judge your own costs	11.8
TOTAL	100.0

CONS

1. Subcontracting costs more	31.1
2. It results in poorer deliveries	15.5
3. It results in lower quality work	14.9
4. It brings poor production control	11.2
5. It requires extra inspection and supervision	8.7
6. Subcontractors lack equipment, manpower and/or know-how	3.7
7. Subcontractors' distant location is a disadvantage	3.1
8. Others: It means extra paper work; small subcontractors are limited; you have to educate them; you may help set up a competitor; they took on too much work; they're trying to get all they can out of prime contractors	11.8
TOTAL	100.0

been to get out a large volume quickly, and there have been instances where work has been done on machines and via methods not normally employed if more time were available."

Another pointed out that the prime contractor makes a profit even when the sub's costs are too high, unless the prime has price ceilings to contend with. Others admitted that despite such higher costs, it was better to have paid such prices than to have overexpanded, with the probability that such equipment would be left idle most of the time. One stated, "Subcontracting may cost us more, but after all we would not have been able to do the work without subcontracting."

The higher costs of subcontracting were attributed to such factors as the necessity for educating the sub, the high ratio of scrap and rejected work, the extra amount of inspection and expediting involved, and extra paper work. Even where costs were equal or lower, these same factors were cited as disadvantages of varying degrees of importance.

As will be noted in an accompanying tabulation of opinions, of those who criticized subcontracting, 31.1 percent cited higher costs, 15.5 percent mentioned poorer deliveries, 14.9 percent complained of lower quality work, and 11.2 percent referred to loss of production control. The necessity for extra inspection and supervision was cited by 8.7 percent, while other complaints were in diminishing importance.

Subs Dislike it, Too!

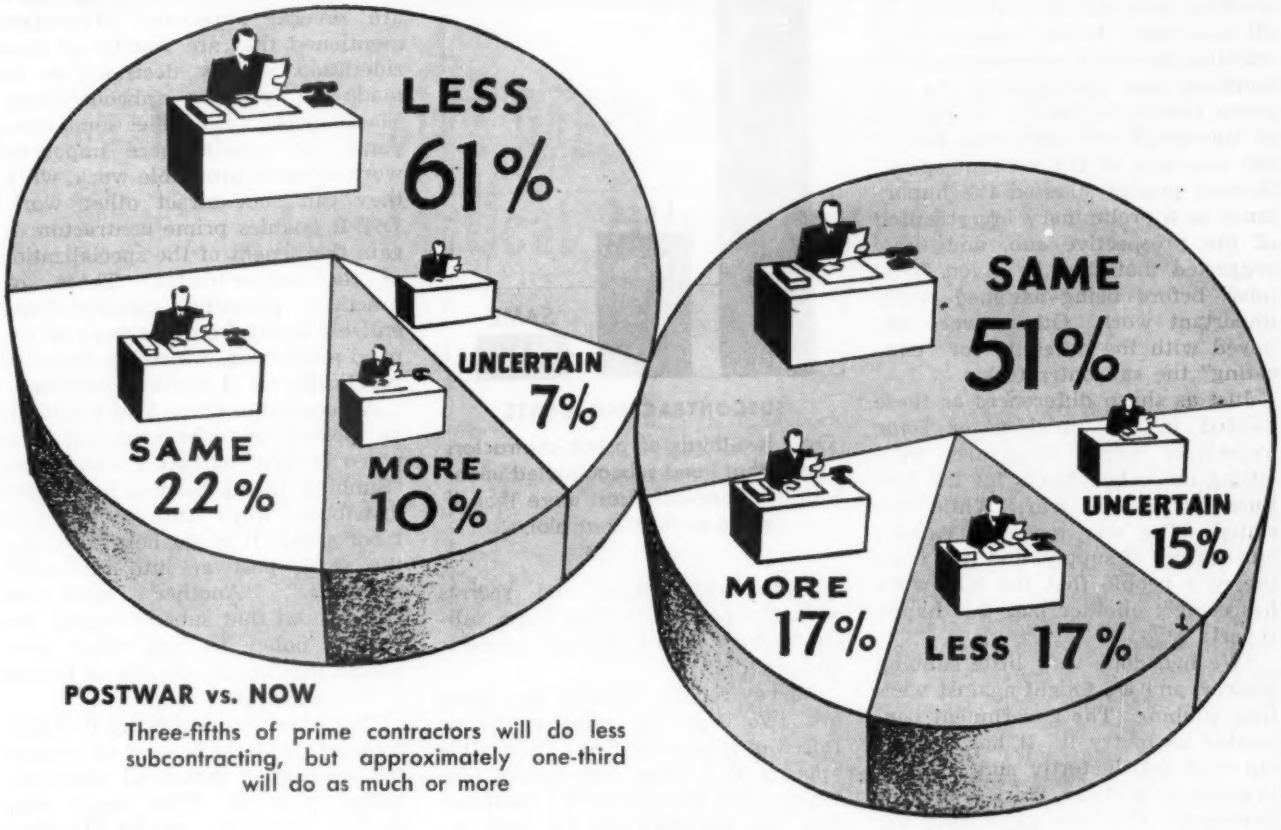
Contractors complaining of the necessity for extra inspection and expediting, usually referred to the fact that this runs up subcontracting costs. But how do the subcontractors feel about this "extra inspection" some prime contractors make much ado about? The field men sounded out a few typical subs on this point, and this is the strongest reaction:

"We don't want any postwar subcontracts, because there are too many headaches for us. You wonder whether or not you'll get paid, your plant is full of expediters tearing around, sticking their noses into things that are none of their business and just being a general nuisance."

Some contractors laid the blame for unsatisfactory subcontracting work on the prime contractors themselves. One official stated, "Substandard work and other difficulties with subcontractors can be blamed on the person letting the subcontract. Instead of dumping a job in a fellow's lap and telling him to go to work, we sit down, give him the background of the job, explain it in a minute detail, and are always ready for his problems. This system pays dividends."

Those contractors with the patience and effort to work with subcontractors usually netted good results. One company with 600 subcontractors and satisfied with its wartime subcontracting experiences, explained, "We have learned from working with our subs what the various ones are best equipped to do, and how their facilities can best be fitted to our production needs. We have weeded out the unreliable few, and from the beginning when

• SUBCONTRACTING'S FUTURE •



POSTWAR vs. NOW

Three-fifths of prime contractors will do less subcontracting, but approximately one-third will do as much or more

POSTWAR vs. PREWAR

Half of the prime contractors reporting will subcontract to the same degree; another third will pursue different policies

a great deal of supervision on our part was required, we have gradually advanced to the point where we can depend on getting what we want without having to keep a constant time and manpower watch."

Another contractor reported: "We had to school some of our subs not used to working to close tolerances. We reduced scrap percentage of our subs' work from 20 percent to three percent in a year-and-a-half through a field inspection service."

The spokesman of one company which had tried 75 subcontractors during the war and "found 40 who can give us what we want" paid this tribute to small subs: "The small subcontractor is due a lot of credit. He's an unsung hero and a forgotten man. He has often tackled jobs that seemed impossible considering equipment and manpower, but he has come through by ingenious methods and long hours. Subs have helped us meet our schedules in bad spots; they add to your plant capacity in a hurry. I've known instances where large companies have turned 'hot potatoes' over to the little fellows. In such cases, the larger company has taken the credit for unusual 'know-how.'"

Strangely enough, condemnations of the work of small subs were almost as strongly advanced as was praise of small shops. One company which used 200 subs said, "Medium and large ones have given us good service, but results from the smaller ones have been disappointing. The small subcontractor's equipment should be carefully analyzed before placing orders. On the whole, subcontracting has worked out very satisfactorily." Another contractor stated, "The small wartime sub is not sufficiently experienced in our type of precision to turn out uniformly good work."

Small Subs Praised

In contrast to these negative comments, are these statements from other contractors:

1. "We had one subcontractor over 75 years old, who bought some broken-down screw machinery, tied it together, put it in the basement of a bowling alley, hired an auto mechanic and started doing lathe work, milling and chucking for us. His tolerances were remarkably good. We took on an established firm as a subcontractor, set them up and gave them a lot of jobs, none of which they did too well. One day the contract was cancelled. We, of course, had to cancel their contract, and they blamed us for the whole business. Ever since then, we have let subcontracts in very small doses to a lot of different people."

2. "Small shops can't work to our tolerances. They often lack equipment and know-how. But we've worked backyard garage shops here and small plants in cow-pastures in Michigan into our production picture. With a certain amount of education and supervision on our part, we've gotten good results. Costs have been in line. Small shops don't have our overhead."

3. "The small sub's chances of postwar survival are as good as the larger fellow's. It is unfair to blame everything that goes wrong on the subcontractor."

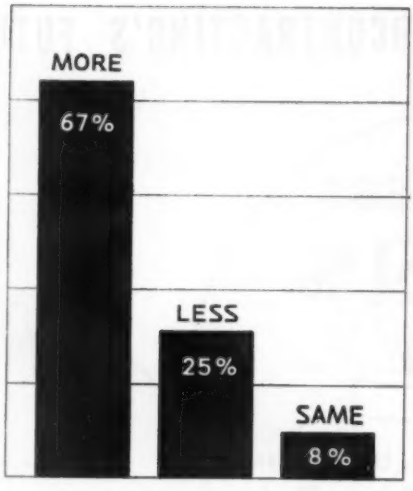
These contrasting opinions stem

from the relative experience each prime contractor has with his particular subs, and the patience and care exercised by each prime in working with his subcontractors. It all boils down to the importance of selecting the right subcontractor and handling him intelligently. As one prime contractor put it, "90 percent of successful subcontracting lies in the selection of the subcontractor." Several primes stressed the importance of a preliminary investigation of the prospective sub, and some suggested that they be given "trial jobs" before being assigned really important work. Others were annoyed with the necessity for "educating" the subcontractors.

Just as sharp differences as these existed in the opinions of some executives whose companies were letting out subcontracts for the first time during the war. While one stated, "The war made us expand our sources of supply, and it is from the new people that the bad work has come"; another had this happy report:

"We had done very little subbing prewar, and we fought against wartime subbing. The government persuaded us to try it. It has worked out very satisfactorily and we plan to continue postwar. Work is to close tolerances. Our war experience has demonstrated we can operate more efficiently using subs, and it is very convenient and desirable as a standard procedure. Rejects have been less than one percent of subcontracted work, and since many jobs were new to us, we really had no yardstick to measure by. The advantage of subcontracting is that it saves floor space, plant expansion and capital investment. Overall, sub costs have been slightly higher than our own. Postwar we will sublet the work that subs can do as cheaply or cheaper than we can."

A few contractors were afraid that subcontracting permitted leaks of manufacturing plans and secrets with the possibility that some subcontractors might become postwar competitors.



SUBCONTRACTING COSTS

Over two-thirds of prime contractors report that items subcontracted under wartime conditions cost more than if made in their own plants

Survey reports indicate that there are two sides to most criticisms raised of subcontracting. Over-all it appears that those contractors who approached subcontracting realistically and patiently got the best results. Others who expected subcontractors to undertake new war assignments and perform them perfectly without much instruction or supervision appear to be those who are most disappointed.

Of significance to wartime subcontracting are the expectations of some contractors that since postwar work will be less exacting than wartime work, they will probably have less trouble with subcontracting postwar than they have had up to now. Others expect wartime difficulties over deliveries and costs to be ironed out postwar, because subcontractors will be competing for sub work and will have to justify any business they get to survive.

Other than the pros and cons of subcontracting already cited, there are several important advantages mentioned that are worthy of consideration in any decisions to be made on postwar subcontracting. These are (A) It enables some companies to handle more important work or more profitable work, while they can subcontract other work; (B) It enables prime contractors to gain the benefit of the specialization of the subcontractor. These are practical planning considerations, entirely apart from the need to expand production, which has impelled practically all of wartime subbing.

An economic value that might lie in peacetime subcontracting was posed by one contractor who stated, "Subbing during the war has helped distribute work into non-critical labor areas. It might help spreading the work postwar into idle communities." Another contractor pointed out that subcontracting was a good policy to help other companies that are in distress or having a temporary slack.

This poses the possibility that subcontracting might be used as a means for leveling off industrial peaks and valleys postwar. Thus, some companies enjoying record business could secure help from those in temporary depressions, and this exchange might be reversed later on. Some contractors, who had never before done subcontract work, frankly stated they would consider such work when their regular business slumps.

But for most contractors, wartime subcontracting has taught numerous lessons which can be capitalized on postwar. While this points to a continuation of a substantial amount of subcontracting postwar, it means also that contractors will be choosier postwar, even more so than they were prewar.

• **Wartime subcontracting** has increased the self-confidence of small and medium-sized subcontractors, who have seen their output and efficiency proped satisfactory to the most exacting customers. Postwar many of them will seek new subcontract work aggressively, knowing that they will be expected to offer cost savings, satisfactory deliveries and high quality work. Those who have made a poor showing during the war and charged exhorbitant prices will have little chance of maintaining their wartime relationships or making new connection with prime contractors when peace returns.

Plug and Ring Gages for Classes 2 and 3 Aeronautical Screw Threads—I

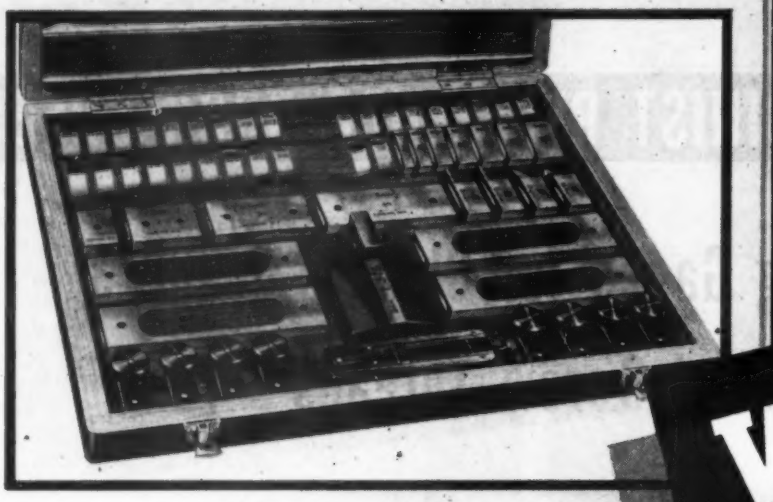
BY LOUIS deL. BERG

TO SAVE the product inspector's time in selecting plug thread and ring gages of the proper pitch diameter, it is convenient to have a table which gives all of the necessary information in one place. A table of this sort is also of value to the gage checker, when he seeks to confirm markings on gages. The desirability of the table is particularly apparent when a plant is making a wide variety of threaded products to Army-Navy Specification AN-GGG-S-126a for standard aircraft threads. It frequently happens that drawing specifications for the threads merely list the size, pitch and class but not the pitch diameter, and it becomes necessary for the lead man or inspector to refer to handbooks or tables to select the proper plug thread or ring gage.

To pick out the desired information for pitch diameter of go and not go gages requires considerable searching, if the inspector works with the National Bureau of Standards Handbook H28(1944), which must of necessity list much data not pertinent to inspector's requirements. And if he uses AN-GGG-S-126a, the possibility of error is introduced because only the tolerances from the basic pitch diameter are listed.

Reference to the accompanying tables gives the wanted information at a glance. All threads in the several series contained in AN-GGG-S-126a are listed according to ascension in size, together with the pitch diameters of go and not go plug gages for nuts and go and not go ring gages for screws of Class 2 and Class 3 fit. To find the pitch diameter of a go gage for a nut with a ¾-20 NEF Class 2 or 3 thread, merely read down the left-hand column labeled "Size" until the ¾-20 entry is reached, then move across the table to "Plug Gages for Nuts," and under the column labeled "Go," read 0.7175 in. as the proper pitch diameter for a Class 2 or 3 thread plug gage.

Size	Symbol	Basic Pitch Dia.	Plug Gages for Nuts			Ring Gages for Screws		
			Go	Not Go		Go	Not Go	
			Class	Class		Class	Class	
			2 & 3	2	3	2 & 3	2	3
0-80	NF	0.0519	0.0519	0.0536	0.0532	0.0519	0.0502	0.0506
1-64	NC	0.0629	0.0629	0.0648	0.0643	0.0629	0.0610	0.0516
1-72	NF	0.0640	0.0640	0.0658	0.0653	0.0640	0.0622	0.0627
2-56	NC	0.0744	0.0744	0.0764	0.0759	0.0744	0.0724	0.0729
2-64	NF	0.0759	0.0759	0.0778	0.0773	0.0759	0.0740	0.0745
3-48	NC	0.0855	0.0855	0.0877	0.0871	0.0855	0.0833	0.0839
3-56	NF	0.0874	0.0874	0.0894	0.0889	0.0874	0.0854	0.0859
4-40	NC	0.0958	0.0958	0.0982	0.0975	0.0958	0.0934	0.0941
4-48	NF	0.0985	0.0985	0.1007	0.1001	0.0985	0.0963	0.0969
5-40	NC	0.1088	0.1088	0.1112	0.1105	0.1088	0.1064	0.1071
5-44	NF	0.1102	0.1102	0.1125	0.1118	0.1102	0.1079	0.1086
6-32	NC	0.1177	0.1177	0.1204	0.1196	0.1177	0.1150	0.1158
6-40	NF	0.1218	0.1218	0.1242	0.1235	0.1218	0.1194	0.1201
8-32	NC	0.1437	0.1437	0.1464	0.1456	0.1437	0.1410	0.1418
8-36	NF	0.1460	0.1460	0.1485	0.1478	0.1460	0.1435	0.1442
10-24	NC	0.1629	0.1629	0.1662	0.1653	0.1629	0.1596	0.1605
10-32	NF	0.1697	0.1697	0.1724	0.1716	0.1697	0.1670	0.1678
¼-20	NC	0.2175	0.2175	0.2211	0.2201	0.2175	0.2139	0.2149
¼-28	NF	0.2268	0.2268	0.2299	0.2290	0.2268	0.2237	0.2246
¼-32	NEF	0.2297	0.2297	0.2329	0.2319	0.2297	0.2265	0.2275
5/16-18	NC	0.2764	0.2764	0.2805	0.2794	0.2764	0.2723	0.2734
5/16-24	NF	0.2854	0.2854	0.2887	0.2878	0.2854	0.2821	0.2830
5/16-32	NEF	0.2922	0.2922	0.2955	0.2945	0.2922	0.2889	0.2899
3/8-16	NC	0.3344	0.3344	0.3389	0.3376	0.3344	0.3299	0.3312
3/8-24	NF	0.3479	0.3479	0.3512	0.3503	0.3479	0.3446	0.3455
3/8-32	NEF	0.3547	0.3547	0.3581	0.3571	0.3547	0.3512	0.3523
7/16-14	NC	0.3911	0.3911	0.3960	0.3947	0.3911	0.3862	0.3875
7/16-20	NF	0.4050	0.4050	0.4086	0.4076	0.4050	0.4014	0.4024
7/16-28	NEF	0.4143	0.4143	0.4179	0.4168	0.4143	0.4107	0.4118
½-13	NC	0.4500	0.4500	0.4552	0.4537	0.4500	0.4448	0.4463
½-20	NF	0.4675	0.4675	0.4711	0.4701	0.4675	0.4639	0.4649
½-28	NEF	0.4768	0.4768	0.4805	0.4794	0.4768	0.4731	0.4742
9/16-12	NC	0.5084	0.5084	0.5140	0.5124	0.5084	0.5028	0.5044
9/16-18	NF	0.5264	0.5264	0.5305	0.5294	0.5264	0.5223	0.5234
9/16-24	NEF	0.5354	0.5354	0.5394	0.5382	0.5354	0.5314	0.5326
5/8-11	NC	0.5660	0.5660	0.5719	0.5702	0.5660	0.5601	0.5618
5/8-18	NF	0.5889	0.5889	0.5930	0.5919	0.5889	0.5848	0.5859
5/8-24	NEF	0.5979	0.5979	0.6020	0.6008	0.5979	0.5938	0.5950
¾-10	NC	0.6850	0.6850	0.6914	0.6895	0.6850	0.6786	0.6805
¾-16	NF	0.7094	0.7094	0.7139	0.7126	0.7094	0.7049	0.7062
¾-20	NEF	0.7175	0.7175	0.7221	0.7207	0.7175	0.7129	0.7143
1 5/16-20	NEF	0.7800	0.7800	0.7846	0.7832	0.7800	0.7754	0.7768
⅞- 9	NC	0.8028	0.8028	0.8098	0.8077	0.8028	0.7958	0.7979
⅞-14	NF	0.8286	0.8286	0.8335	0.8322	0.8286	0.8237	0.8250



WEBBER GAGE BLOCKS

A constant unit of measurement

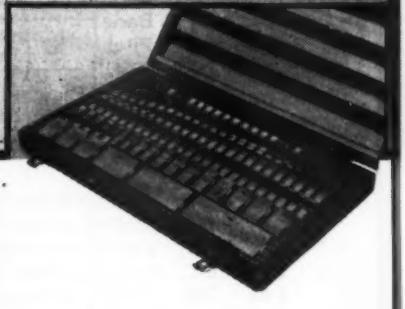
To adequately meet the increasing demand for precision in the manufacture of parts, gage blocks are more essential than ever as a constant unit of measurement.

Webber Gage Blocks have all the essential qualities for maintaining dependable accuracy. Rigid inspection of every Wegger Gage Block insures its dimensional accuracy. Webber has developed a steel and method of treatment which guarantees against changing size for any reason except normal wear.

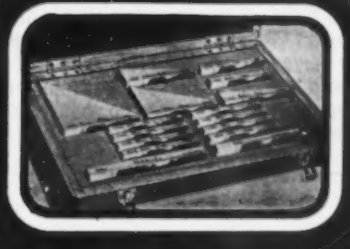
Webber Gage Blocks are given the finest finish commercially possible to put on steel—to provide maximum accuracy—reduce wear—and improve wringing.

Performance records prove that Webber Gage Blocks have exceptional "wearing quality" —stand up under normal usage without showing excessive wear.

Webber service provides complete facilities for the inspection—reconditioning—and replacing of worn or damaged blocks at a moderate cost.



Illustrating a Webber 84-A Standard Inspection Set. 84 blocks in sizes from .050" to 4.000". Accuracy .000004".



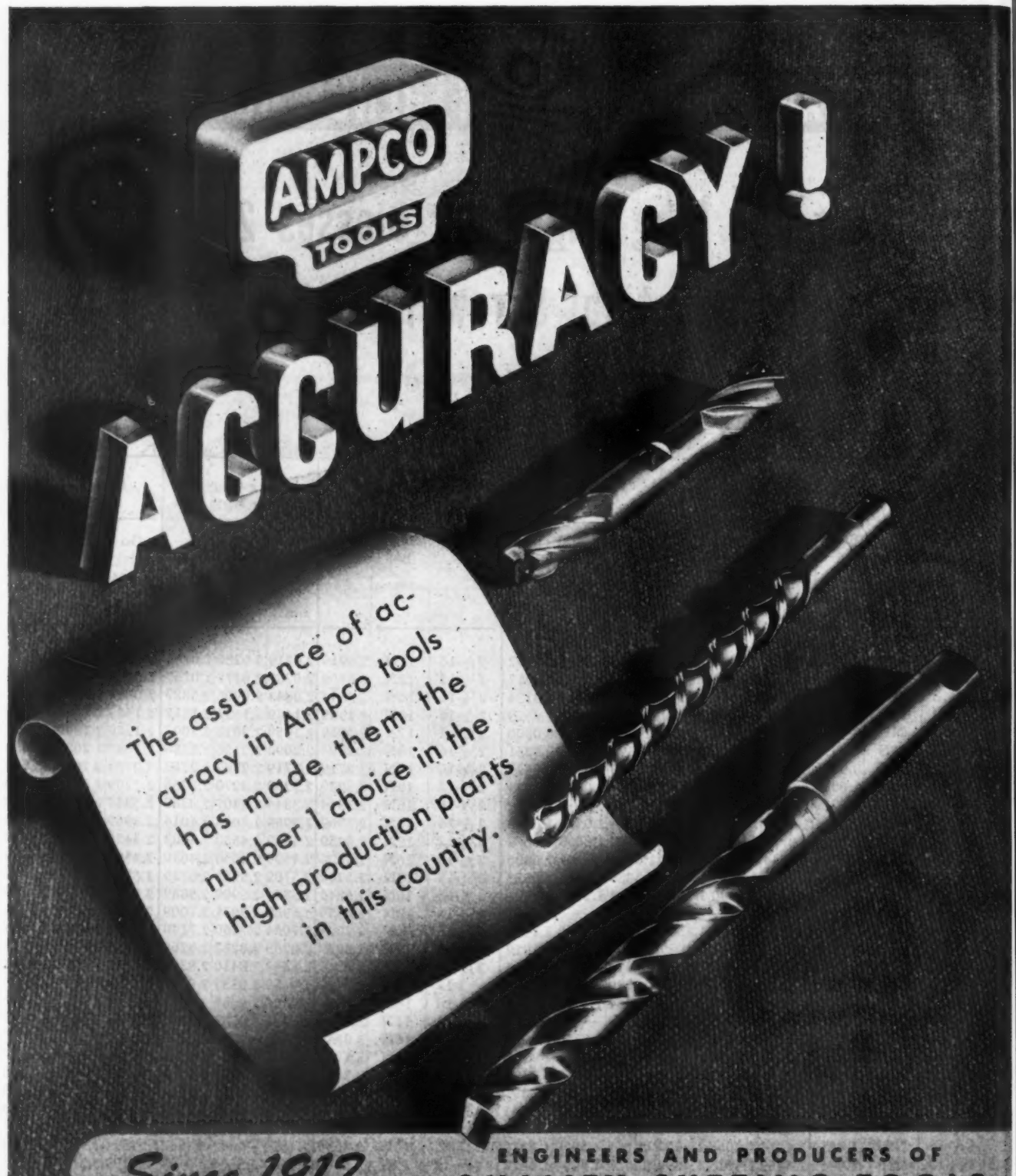
Webber
GAGE COMPANY
12901 TRISKETT RD. • CLEVELAND 11, OHIO

Plug and Ring Gages for Classes 2 and 3 Aeronautical Screw Threads—II

BY LOUIS deL. BERG

Size	Symbol	Basic Pitch Dia.	Plug Gages for Nuts			Ring Gages for Screws		
			Go	Not Go		Go	Not Go	
			Class	Class		Class	Class	
			2 & 3	2	3	2 & 3	2	3
7/8-20	NEF	0.8425	0.8425	0.8472	0.8458	0.8425	0.8378	0.8392
15/16-20	NEF	0.9050	0.9050	0.9097	0.9083	0.9050	0.9003	0.9017
1- 8	NC	0.9188	0.9188	0.9264	0.9242	0.9188	0.9112	0.9134
1-12	12N	0.9459	0.9459	0.9515	0.9499	0.9459	0.9403	0.9419
1-14	NF	0.9536	0.9536	0.9585	0.9572	0.9536	0.9487	0.9500
1-16	16N	0.9594	0.9594	—	0.9631	0.9594	—	0.9551
1-20	NEF	0.9675	0.9675	0.9723	0.9709	0.9675	0.9641	0.9627
1 1/16-12	12N	1.0084	1.0084	1.0140	1.0124	1.0084	1.0028	1.0044
1 1/16-16	16N	1.0219	1.0219	—	1.0256	1.0219	—	1.0182
1 1/16-18	NEF	1.0264	1.0264	1.0312	1.0300	1.0264	1.0216	1.0228
1 1/8-12	12N	1.0709	1.0709	1.0765	1.0749	1.0709	1.0653	1.0669
1 1/8-16	16N	1.0844	1.0844	—	1.0882	1.0844	—	1.0806
1 1/8-18	NEF	1.0889	1.0889	1.0941	1.0925	1.0889	1.0837	1.0853
1 3/16-12	12N	1.1334	1.1334	1.1390	1.1374	1.1334	1.1278	1.1294
1 3/16-16	16N	1.1469	1.1469	—	1.1507	1.1469	—	1.1431
1 3/16-18	NEF	1.1514	1.1514	1.1566	1.1550	1.1514	1.1462	1.1478
1 1/4-12	NF	1.1959	1.1959	1.2015	1.1999	1.1959	1.1903	1.1919
1 1/4-16	16N	1.2094	1.2094	—	1.2132	1.2094	—	1.2056
1 1/4-18	NEF	1.2139	1.2139	1.2192	1.2176	1.2139	1.2086	1.2102
1 5/16-12	12N	1.2584	1.2584	1.2640	1.2624	1.2584	1.2528	1.2544
1 5/16-16	16N	1.2719	1.2719	—	1.2758	1.2719	—	1.2680
1 5/16-18	NEF	1.2764	1.2764	1.2817	1.2801	1.2764	1.2711	1.2727
1 3/8-12	NF	1.3209	1.3209	1.3265	1.3249	1.3209	1.3153	1.3209
1 3/8-16	16N	1.3344	1.3344	—	1.3383	1.3344	—	1.3305
1 3/8-18	NEF	1.3389	1.3389	1.3443	1.3427	1.3389	1.3335	1.3351
1 7/16-12	12N	1.3834	1.3834	1.3890	1.3874	1.3834	1.3778	1.3794
1 7/16-16	16N	1.3969	1.3969	—	1.3929	1.3969	—	1.4009
1 7/16-18	NEF	1.4014	1.4014	1.4068	1.4052	1.4014	1.3960	1.3976
1 1/2-12	NF	1.4459	1.4459	1.4515	1.4499	1.4459	1.4403	1.4419
1 1/2-16	16N	1.4594	1.4594	—	1.4554	1.4594	—	1.4634
1 1/2-18	NEF	1.4639	1.4639	1.4694	1.4677	1.4639	1.4584	1.4601
1 9/16-18	NEF	1.5264	1.5264	1.5319	1.5303	1.5264	1.5209	1.5225
1 5/8-12	12N	1.5709	1.5709	1.5773	1.5754	1.5709	1.5645	1.5664
1 5/8-16	16N	1.5844	1.5844	—	1.5803	1.5844	—	1.5885
1 5/8-18	NEF	1.5889	1.5889	1.5945	1.5928	1.5889	1.5833	1.5850
1 11/16-18	NEF	1.6514	1.6514	1.6570	1.6553	1.6514	1.6458	1.6475
1 3/4-12	12N	1.6959	1.6959	1.7024	1.7005	1.6959	1.6894	1.6913
1 3/4-16	16N	1.7094	1.7094	1.7153	1.7135	1.7094	1.7035	1.7053
1 13/16-16	16N	1.7719	1.7719	1.7778	1.7761	1.7719	1.7660	1.7677
1 7/8-12	12N	1.8209	1.8209	1.8275	1.8255	1.8209	1.8143	1.8163
1 7/8-16	16N	1.8344	1.8344	1.8404	1.8386	1.8344	1.8284	1.8302
1 15/16-16	16N	1.8969	1.8969	1.9029	1.9011	1.8969	1.8909	1.8927
2-12	12N	1.9459	1.9459	1.9526	1.9502	1.9459	1.9392	1.9412
2-16	16N	1.9594	1.9594	1.9655	1.9637	1.9594	1.9533	1.9551

Size	Symbol	Basic Pitch Dia.	Plug Gages for Nuts			Ring Gages for Screws		
			Go	Not Go		Go	Not Go	
			Class	Class		Class	Class	
			2 & 3	2	3	2 & 3	2	3
2 1/16-16	16N	2.0219	2.0219	2.0280	2.0262	2.0219	2.0158	2.0176
2 1/8-12	12N	2.0709	2.0709	2.0777	2.0757	2.0709	2.0641	2.0661
2 1/8-16	16N	2.0844	2.0844	2.0906	2.0887	2.0844	2.0782	2.0801
2 1/16-16	16N	2.1469	2.1469	2.1531	2.1512	2.1469	2.1407	2.1426
2 1/4-12	12N	2.1959	2.1959	2.2028	2.2007	2.1959	2.1890	2.1911
2 1/4-16	16N	2.2094	2.2094	2.2156	2.2138	2.2094	2.2032	2.2050
2 1/16-16	16N	2.2719	2.2719	2.2782	2.2763	2.2719	2.2656	2.2675
2 3/8-12	12N	2.3209	2.3209	2.3279	2.3258	2.3209	2.3139	2.3160
2 3/8-16	16N	2.3344	2.3344	2.3407	2.3388	2.3344	2.3281	2.3300
2 7/16-16	16N	2.3969	2.3969	2.4033	2.4014	2.3969	2.3905	2.3924
2 1/2-12	12N	2.4459	2.4459	2.4530	2.4508	2.4459	2.4388	2.4410
2 1/2-16	16N	2.4594	2.4594	2.4658	2.4639	2.4594	2.4530	2.4549
2 5/8-12	12N	2.5709	2.5709	2.5780	2.5759	2.5709	2.5638	2.5659
2 5/8-16	16N	2.5844	2.5844	2.5909	2.5889	2.5844	2.5779	2.5799
2 3/4-12	12N	2.6959	2.6959	2.7031	2.7009	2.6959	2.6887	2.6909
2 3/4-16	16N	2.7094	2.7094	2.7160	2.7140	2.7094	2.7028	2.7048
2 7/8-12	12N	2.8209	2.8209	2.8282	2.8260	2.8209	2.8136	2.8158
2 7/8-16	16N	2.8344	2.8344	2.8410	2.8390	2.8344	2.8278	2.8298
3-12	12N	2.9459	2.9459	2.9533	2.9510	2.9459	2.9385	2.9408
3-16	16N	2.9594	2.9594	2.9661	2.9641	2.9594	2.9527	2.9547
3 1/8-12	12N	3.0709	3.0709	3.0783	3.0761	3.0709	3.0635	3.0657
3 1/8-16	16N	3.0844	3.0844	3.0912	3.0891	3.0844	3.0776	3.0797
3 1/4-12	12N	3.1959	3.1959	3.2034	3.2011	3.1959	3.1884	3.1907
3 1/4-16	16N	3.2094	3.2094	3.2163	3.2142	3.2094	3.2025	3.2046
3 3/8-12	12N	3.3209	3.3209	3.3285	3.3262	3.3209	3.3133	3.3156
3 3/8-16	16N	3.3344	3.3344	3.3413	3.3392	3.3344	3.3275	3.3296
3 1/2-12	12N	3.4459	3.4459	3.4535	3.4512	3.4459	3.4383	3.4406
3 1/2-16	16N	3.4594	3.4594	3.4664	3.4642	3.4594	3.4524	3.4546
3 5/8-12	12N	3.5709	3.5709	3.5786	3.5763	3.5709	3.5632	3.5655
3 5/8-16	16N	3.5844	3.5844	3.5915	3.5893	3.5844	3.5773	3.5795
3 3/4-12	12N	3.6959	3.6959	3.7037	3.7013	3.6959	3.6881	3.6905
3 3/4-16	16N	3.7094	3.7094	3.7165	3.7144	3.7094	3.7023	3.7044
3 7/8-12	12N	3.8209	3.8209	3.8287	3.8264	3.8209	3.8131	3.8154
3 7/8-16	16N	3.8344	3.8344	3.8416	3.8394	3.8344	3.8272	3.8294
4-12	12N	3.9459	3.9459	3.9538	3.9514	3.9459	3.9380	3.9404
4-16	16N	3.9594	3.9594	3.9666	3.9645	3.9594	3.9522	3.9543
4 1/4-12	12N	4.1959	4.1959	4.2039	4.2015	4.1959	4.1879	4.1903
4 1/2-12	12N	4.4459	4.4459	4.4540	4.4516	4.4459	4.4378	4.4402
4 3/4-12	12N	4.6959	4.6959	4.7042	4.7017	4.6959	4.6876	4.6901
5-12	12N	4.9459	4.9459	4.9543	4.9518	4.9459	4.9375	4.9400
5 1/4-12	12N	5.1959	5.1959	5.2044	5.2018	5.1959	5.1874	5.1900
5 1/2-12	12N	5.4459	5.4459	5.4545	5.4519	5.4459	5.4373	5.4399
5 3/4-12	12N	5.6959	5.6959	5.7046	5.7020	5.6959	5.6872	5.6898
6-12	12N	5.9459	5.9459	5.9547	5.9521	5.9459	5.9371	5.9397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Gaging Business

Tool Backlog Dropping

Despite the influx of foreign business and continued placement of unrated orders, the machine tool industry's backlog continues to drop and has now fallen to a six-months' total, as against the eight-month backlog on hand two months ago. This has been due to continued heavy cancellations and declining new business. June's new orders fell to $35,178,000 from May's $42,635,000, whereas June cancellations amounted to $11,977,000 as against May's $16,437,000. The industry's mid-year backlog of $256,871,000 included $106,551,000 in unrated orders.

New unrated business for reconversion and postwar dropped to $19,891,000 from May's $22,038,000. However, only a few cancellations have represented unrated business—of the May and June total, only $7,500,000 represented cancellations of unrated orders—indicating that military order cancellations continue heavy.

It is reported that Russian business has not been officially cancelled yet, in view of the changed status of lend-lease. It is estimated that through July, Russia had received some $80,000,000 in tools against its original order for $120,000,000 in the current protocol year, meaning that $40,000,000 remains to be cancelled, probably in August. This business is being replaced by new Russian orders on a cash basis, rated AA-3.

Other Surpluses Abroad

Those visualizing large foreign market for our surplus tools are apparently overlooking the fact that large numbers of tools during the war were also produced by Great Britain, Canada, Australia, and Germany. While most German equipment will be moved out of that nation and distributed to other European countries, in accordance with the latest Big Three decision, British Empire countries are beginning to liquidate their wartime surplus tools now. In the past four years, Australia produced 40,000 machine tools, and only imported one-third as many. Since 1939, the Canadian government has acquired title to $170,000,000 worth of machine tools, perhaps numbering around 4,000 units. The British installed 459,000 tools in their industry during the war, and three out of every four were British made, with the balance imported from Great Britain. Although no one has proposed any of these nations as potential markets for surplus American tools, the factor that is just now being realized is that some of them may plan to dump some of their surplus tools in the foreign market.

Reconversion Lagging

Washington finally admitted that reconversion has been going badly, as many people had suspected for some time. Spot shortages of material and manpower, strikes, continuing government controls, business caution, and other reasons are being raised. However, considerable blame is being placed at the door of the military.

Even though the Army and Navy are said to have their V-J cancellation telegrams ready, military cutbacks right now are coming through slower than had been expected. Moreover, the military has maintained and increased certain types of business that interfere with reconversion progress. One particular example is the Army's new program to "can" surplus armaments, such as anti-aircraft guns, for storage against future use. Whether or not this program might have been deferred to a future date, the fact remains that it calls for hundreds of thousands of tons of sheet steel, which is the tightest reconversion material.

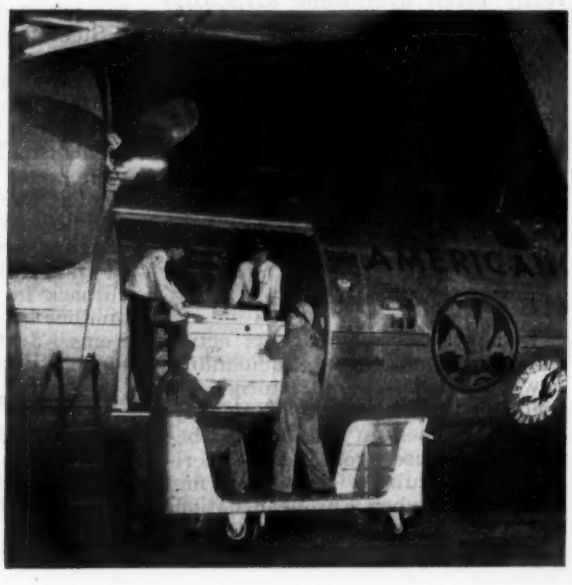
Cheery Postwar Forecasts

Despite these difficulties, surveys are beginning to reveal the pent-up demand for equipment and construction existing today. A Department of Commerce survey reveals that 7,000 representative manufacturing concerns plan to spend $4,500,000,000 for plant, equipment, and alterations, of which over 50 percent will go for machinery and equipment, 30 percent for plants.

Within a few days of this survey, E. R. Galvin, president, Tyson Bearing Corp., speaking of the prospects for 350 construction machinery companies, pointed out that various leading authorities had estimated postwar construction expenditures at from $12 to $26 billions. The Lionel D. Edie Company estimated that the railroads might spend about $2½ to $5 billions on roadway and structures over the next five years. Meanwhile, a report to AMERICAN MACHINIST indicated that office equipment builders expect to operate at capacity for years on orders now booked and in the offing.

As optimistic as all these forecasts appear on the surface. Each of them is qualified in some way by indicating that such plans might be changed in the light of future developments. Industry is still in the dark on OPA's future policies; indications are that the War Production Board controls may be retained through reconversion; reports are that the War Labor Board may remove wage ceilings; tax relief for industry has not been forthcoming yet; tariff policies and foreign trade are still in the realm of glowing conjecture.

Other government policies are still worrying industry, particularly in the light of the British elections. While some wishful thinkers pushed certain legislation here, such as the "Full Employment Bill" on the strength of the British trend, others coldly pointed out that Sir William Beveridge, sponsor of the super-social-security-plan, known as the Beveridge Plan, was defeated at the same elections.



Postwar—Air freight is gaining impetus from American Airlines operation of cargo models of Convair's high-capacity model 39. Westbound shipments of auto parts, kitchen ranges, machinery and other heavy freight will be balanced by eastbound cargoes of fresh fruits and vegetables. The 90-day research project of Convair and American Airlines is proving that large-scale shipment of such goods is practical

Foreign Trade Spotlights Cleveland Machine Tool Market

Russians seeking excessive terms, as red tape hampers Belgian business. National Acme sees bright postwar market.

CLEVELAND — The tool market here has evinced great interest in developing foreign business, but trouble spots have been cropping up here and there. One such instance is the report that Amtorg, Russian purchasing agency in the United States, has in at least two instances been seeking a 20-year guarantee on machine tools to be purchased, plus many other unacceptable conditions. Needless to say, a leading Cleveland builder who was sent a 10-page contract by Amtorg incorporating such terms fired back the order and the contract as being entirely unacceptable.

It is possible that this may have been a feeler put out by Amtorg to try to secure more exacting terms now that the European War is over. This possibility is strengthened by the fact that two other tool builders have had their standard contracts accepted and approved by Amtorg. In these cases, contracts called for payment via sight draft at a New York bank upon delivery of the machine tools at dockside.

Belgian Orders Lag

Another cause for concern has stemmed from the bureaucratic red tape which has limited the placing of Belgian orders for desperately-needed American tools. Since the Belgians have dollars in New York banks to make their purchases, such delays are particularly exasperating to them. Accordingly, it is no surprise that British tool purchases by the Belgians have been increasing.

French interests seem to be having an easier time. They have already taken over some $27,000,000 in machine tools originally destined for Russia under lend-lease, and are negotiating for placement of additional orders expected to total around $30,000,000. Indian representatives, who are limited in their ability to buy due to English control of available funds, have made some purchases and indicated that their nation is in the market for all manner of precision tools.

New Tools Sought

Without exception, agents acting for foreign nations are demanding new products, manufactured for them on their orders. This demonstrated wariness in used tools is believed to arise from past experiences, particularly after the first World War, when European nations found that many of the used American tools sold to them were unfit for service when assembled.

Several Cleveland concerns look forward to bright postwar prospects. National Acme Company has sufficient orders on hand now to keep the plant operating at capacity for a solid year. Except for possible market disruptions stemming from the possible dumping of government surpluses, company officials feel that postwar output of their automatic machines for the first five years will average well above normal.

Lord Pricing Controversy

Considerable interest is being shown locally in the federal suit filed by the Lord Manufacturing Company, Erie, Pa., whose plant was taken over by the Navy under presidential order October 24, 1944. The company charges that Lt. Comdr. N. H. Collisson, executive officer of the plant, exceeded his authority and illegally seized certain machinery, and that the company's production has materially decreased since government operation began. The company charged that Lt. Comdr. Collisson directed removal of some Lord-owned machinery from subcontractors' plants; that part of the machinery was delivered to the Navy; and that other machinery had been delivered to plants of lessees and is not being used for production of the company's material.

A brief was filed by Lt. Comdr. Collisson on July 23rd, in which he denied the charges. He further pointed out that the company had met all its production quotas during the Navy's operation of the plant.

The entire controversy stems from the Navy's attempt to reduce prices on Lord products, on the grounds of the company's soaring profits. The Navy ordered a 32 percent reduction in the Lord list price in 1944. When Lord refused, the government seized the plant.

Surplus War Materiel Being Canned in Steel, Aluminum for Future Use

WASHINGTON—Steel and aluminum containers are being used by the Army to "can" surplus war materiel. The program has been quietly underway since last April with the work being done by the Glenn L. Martin Company, at Baltimore; the American Bridge Company, at Ambridge, Pennsylvania; and research correlation done by the International Harvester Company, Chicago. When completed, 500,000 tons of metals will have been used to can 10,000,000 tons of war stocks suitable for the next war or for sale to approved foreign governments.

Steel sheets ranging from 16 gage to ¼ inch thick are being used in limited quantities now for containers that protect such items as 40 mm and 90 mm guns, fire control equipment, small arms, optical instruments, and even rubber tires. When steel is more plentiful, the program will be stepped up. Aluminum sheets ranging from 20 gauge to ⅛ inch, in plentiful supply because of the cutback in plane production, makes another type of container for similar items. Just now anti-aircraft and aircraft weapons are the big surplus.

Maintenance Saved

There are two types of containers in many shapes adapted to whatever goes into them. Steel has the advantage of hermetically tight welded seams that won't leak under thermal changes. This is important because the canned war material will be stored all over the country outdoors. No grease will be used to protect guns and other machinery from oxydation. Instead a nitrogen atmosphere will replace the air in the cans. Nitrogen, being an inert gas, does not cause rust. This means that guns will be ready for immediate use and need not be overhauled annually—a maintenance item that in the past has amounted to 10% of the value of war stocks.

Ordnance officers credit Major General Levin H. Campbell, Jr. with the idea. When he was production chief at Rock Island Arsenal back in the '20s he experimented with cans containing oil as a preservative. During the present war, the new method was developed at the Massachusetts Institute of Technology, Cornell, Johns Hopkins, Northwestern, and Akron universities. Nitrogen is used instead of helium because it is available at most military bases.

Biggest advantages of canning war equipment, in addition to the saving on maintenance, are dispersal possibilities, economies on warehouses, and ease of shipment. War goods can be scattered all over where no enemy pinpoint bombers can destroy a great dump. New warehousing totalling 300,000,000 cu ft. would otherwise have to be built. Guns in cans can be floated ashore from ships, other items can be rolled.

Detroit Letter

Kaiser-Frazer Car

The Kaiser-Frazer entry as a new producer in the passenger car manufacturing field is being received here with a somewhat tongue-in-cheek attitude. Some doubt is being cast on whether the announcement will be followed by any actual building of an automobile.

One of the reasons behind the doubt is the low capitalization of the new company. The $5,000,000 which will start the firm off on its venture is hardly enough to build one automobile. Another factor is that the coast section of the Kaiser-Frazer Corp. has not yet decided where it will build the low-priced Kaiser car. If the company has progressed to the stage where a dual announcement was made on the west coast and here, observers ask why haven't the plans reached the stage where the promoters of the idea know the location for the new automotive center of the Pacific coast?

On the other hand, interest has been high in the new company. Henry Kaiser's record of achievements in the building field, as well as in the ship construction end, intrigues the lay mind and lends credence to the seriousness of his intentions to bring a new industry to the coast.

Chrysler Hit Recalled

There is no doubt that the field is ripe for a new entry. It may be recalled that after the last war, a large number of new companies took a fling at bucking the big league and the larger independents. True, not many survived for long because the auto manufacturing business deals in high figures.

But a little known company came along and now is one of the "Big Three." This was Chrysler Corp. There was plenty of scoffing at Walter P. Chrysler's temerity when he announced plans to invade the field. He brought out the Chrysler car in 1924, paid $10,000,000 in dividends to shareholders in 1927 and in 1928 took over Dodge Brothers and introduced the low-priced Plymouth and then the DeSoto.

Both Kaiser and Joseph Washington Frazer are great promoters. Frazer in addition is a wizard salesman and can put over a product. He has had much training in the auto business since 1912. In addition, he was associated with the late Chrysler and was sales manager of the corporation. Recently, his financial ability was demonstrated when it was revealed that he turned a $500 investment in the Warren City Manufacturing Co. into a million.

Graham-Paige Car

A sad sidelight of the Kaiser-Frazer union is the fact that the Graham-Paige name becomes but a memory. While the corporation will continue in existence, no passenger car by that name will hereafter be in the field.

The medium-priced car which Frazer plans to build here will be called the Frazer. Kaiser's contribution on the coast will be the Kaiser car. And the tractor which will be built in the Warren, O., subsidiary will be also called the Frazer.

But what has happened to brand new Graham-Paige which Frazer so enthusiastically announced not so long ago? It was to have been the first entirely new automobile in the field. It was to have incorporated all the new ideas which the "art and chromium" boys had been feeding the gullible public during the war.

There was even a quarter-size mockup of this new car around Graham-Paige headquarters. It is presumed that now it will be the Frazer with some changes which the volatile William B. Stout will dream up. Stout, on loan to the new corporation from Consolidated Vultee, as design consultant, appears to be quite happy in his new connection and the prospect of giving vent to some of his advanced ideas.

Use Plane Plants?

Stout still drives his beetle-shaped Scarab and still entertains high ideals about it. It is the type of car that could very well be built in an airplane factory, which is what Kaiser hinted he would do on the west coast.

The union between the two brilliant and energetic promoters may turn into something substantial—and it may be another one of those big ideas which never materialize.

Meanwhile, production of the authorized quotas of new cars is proceeding slowly. Materials continue to be tight but most of the watchful waiting is for the OPA to settle on a pricing policy. The tag put on the new civilian jeep announced by Willys appears to be no help. The OPA considered it more from the standpoint of a half-ton truck than a passenger car and even though it was priced as a new product, there isn't much for the car builders to fasten on to.

The parts makers are also gnashing their teeth in despair as nothing appears on the horizon to clear their thinking on supplying parts for the car makers.

New Olds Features

The new Olds, on display in the General Motors lobby, is attracting much public attention. The greatest feature of the Olds will not be apparent to the public until it can drive it. This is the new hydramatic which has four speeds forward instead of three and is much more economical than the old type and freer from mechanical ills.

The first Oldsmobiles will be two-door sedans with 100 hp. six-cylinder engines to be followed later with a 110 hp. eight. There will be three model groups: 60 Series with six-cylinder engines on a 119-in. wheel base; 70 Series with six or eight cylinders on a 125-in. wheel base and the 90 Series with 8 cylinders and a 127-in. wheel base. The latter will have a new body style, a sport four-door with wide three-passenger front and rear seats.

The driven clutch plates are now steel instead of bronze and are faced with "Krafelt" (bakelite resin-impregnated composition) and cork. These give longer life and smoother shifting as well as reducing the number of plates required. Reduced friction on cold starts is also claimed.

Other Olds Innovations

Smoother shifting has been obtained by eliminating deflections and inaccuracies in the throttle and transmission control "hook-up."

In the engines of the 70 and 90 series, electro-hardened aluminum alloy pistons have been adopted. New designed connecting rods, lighter in weight are used to further reduce reciprocating weight and add smoothness of operation. New "100" Durex heavy duty precision type main and connecting rod bushings are a new addition to the 1946 engines. All engines are mounted on synthetic rubber which is unaffected by oil.

Die castings are now featured everywhere they can be used in these new cars. The five-piece grill is one place; another is the hood ornament; others include the rub rail on the front fenders, the window handles and escutcheon plates, instrument panel.

A new type of "wrap-around" bumper is used on the front of all models and on the rear of the "70" and "90". They completely protect the corners of the car. Bodies are completely bonderized inside and outside, whereas this was formerly done on fenders only.

Rated Tonnage Continues Heavy; Unrated Sheet Orders Blocked

PITTSBURGH—The volume of rated tonnage—particularly in sheets—has held up beyond all expectations. Priority sheet tonnage is still large, and for such war purposes as ammunition containers, bomb clusters, barracks, bomb fins and containers for parts shipments to soggy climates. This has increased the anxiety of the automobile industry over its steel supply for its 1945 car quota to the extent that it has agreed to take some steel that it would not normally accept.

The steel producers are anxious to begin serving their peacetime customers in a larger way, particularly in the form of cold-rolled sheets, and similar items, which are quite profitable. In fact, the trend toward light flat-rolled material improved their earnings picture in the second quarter. If mills could roll wider sheet and produce more cold-rolled sheet, profits would increase further. However, much of the sheet tonnage now being rolled under rated orders is narrow width. Moreover, lack of manpower and available steel limits cold-rolled output.

Over all, mills are taking unrated tonnage on sheets even though customers are being warned they may have to wait until the fourth quarter or later for delivery; customers are duplicating such orders with various mills; and some automobile sheets are being made.

The situation brought about by alloy-contaminated scrap is now said to be engaging the attention of the industry more exhaustively, and formal notice is reported to have been served on the auto trade that deep draws may be difficult to obtain and that the motor car industry should not expect too much in the stress of present day conditions.

Bars for automobile forgings are expected to be in greater supply in the fourth quarter. It is more difficult to place orders for steel shapes for nearby delivery with some promises now being made for October and November.

Steel ingot production has moved along horizontally now for several weeks around 90 percent of capacity, which is regarded as a satisfactory level for the industry. Strikes, need for maintenance work, vacations and labor shortages are holding operations at this level. However, there is an adequate supply of raw steel over-all, and such bottlenecks as exist are generally due to lack of finishing facilities.

OPA PRICE CONTROL OFF INDUSTRIAL SERVICES

WASHINGTON — Industrial services supplied under war contracts or subcontracts on aircraft, ammunition and other major war items were again exempt from price control by the Office of Price Administration today.

Previously exempt from price control, these services were inadvertently placed under the price coverage of Maximum Price Regulation No. 581, on industrial services when that regulation was issued and made effective in March of this year.

Industrial services include heat treating, annealing, rust proofing, electro-plating etc.,—work done outside the manufacturer's own organization.

The services exempted are those performed on aircraft, ammunition, armored trains, artillery, barrage balloon equipment, bombs, bomb sights, caissons, fire control equipment, gas masks, grenades, gun sights, military bridges, mines, mortar projectiles, pyrotechnics, small arms, ships and boats, and torpedoes; also amphibians, armored vehicles, automobiles, tanks, trailers and trucks when sold for military purposes.

The order contains extensive detail.

Postwar Aviation, Shipbuilding Prospects Encouraged by Krug

LOS ANGELES—Reconversion priorities are working out fairly well according to Chairman J. A. Krug of the War Production Board. On a recent visit here, Krug pointed out that there were only 1,000,000 unemployed in July, as against the 6,000,000 previously expected. He stated that cutbacks already totaled 15 percent down from the five billion monthly war peak, and that the reduction will amount to 40 percent by next March, barring a sudden end to the Pacific War.

Aviation and shipbuilding, widely regarded as having poor postwar prospects, were given great encouragement by Mr. Krug. He stated that the Army and Navy may announce late this year a postwar airplane procurement program to help keep the aviation industry alive.

Moreover, both East Coast and West Coast shipyards will take part in a gigantic reconditioning program for permanent Navy ships, beginning as soon as the war ends. Mr. Krug predicted the program would keep the shipyards busy for at least a year, and perhaps longer.

With respect to West Coast labor shortages, particularly in ship repair yards and on the railroads, Mr. Krug pointed out that railroad maintenance and operation is the problem, and not lack of rolling stock.

Priorities on WPB Cancellation

WASHINGTON—Procedures to be followed by manufacturers after cancellation of military contracts for which they have been authorized to purchase machine tools or building service equipment, after their war contracts have been cancelled or cut back, are outlined in Direction 9 to Priorities Regulation 1:

1: A rating or authorization to get machine tools or other equipment (excluding building service equipment) to be used in the completion of a military contract, may not be used by the manufacturer after the contract has been cancelled or cut back. The manufacturer may still try to get the equipment, if he wants it, without rating or authorization (if permitted) or get a new rating within WPB regulations.

2: The manufacturer may delay advising his supplier of the cancellation, provided he applies to WPB for another rating or authorization within 10 days. WPB ordinarily will notify the manufacturer within 10 days of the new authorization.

3: In the case of building service equipment, such as elevators, plumbing, etc., the manufacturer shall go right ahead, after cancellation or cutback, and use his authorizations.

4: If a manufacturer has already received a machine tool or other equipment obtained of priorities or authorizations for use on a war contract, he may keep the equipment and use it in any way not prohibited, or sell it subject to the limitations of Priorities Regulation No. 13.

Single Priority Application

WASHINGTON—A single application can obtain priorities assistance on any number of items of equipment needed for the initiation, resumption, or expansion of civilian production or services, under a new amendment of Priorities Regulation No. 24, the War Production Board has announced. The changes do not apply to equipment for war production, for which the usual applications must be made out.

However, the general WPB policy still is not to grant priorities assistance for civilian production; the amendment applies only when the following conditions are met: 1: When there is no reasonable prospect that items required can be obtained without assistance; 2: When the items needed are only a small bottleneck portion of the total equipment required; 3: When the items are not wanted merely to increase efficiency; 4: Items are needed to operate at a minimum rate; 5: When the product to be manufactured is needed for the civilian economy; 6: When delivery of the product would be materially delayed by lack of the items needed.

Washington Bulletin

War End Phenomena

The Navy has telegraphic stop orders ready to be sent to war manufacturers immediately after Jap surrender. You can assume the Army is similarly prepared.

A. J. Krug, WPB Chairman, says aircraft and other munitions workers are beginning to look for permanent peacetime jobs because they think the war will soon end. Departure of the best technologists from temporary war jobs to careers with du Pont, Westinghouse, and such companies, began more than a year ago. Now the workers are going. Southern California aircraft industry needs 6000 men badly. Boeing at Seattle is short 600 to 1000. Glenn Martin at Baltimore would like to hire 5000. One California manufacturer recently laid off 5000 hands. Hiring agents of other companies waded into them and succeeded in signing only 100. When the intermediate supervision ranks begin to quit, the aircraft people will be in real trouble.

Krug wants Congress to enact an unemployment compensation law to stop the exodus from war production in general. Many liberal congressmen favor separation pay for war workers, chargeable to the war. William H. Davis, new Director of Economic Stabilization, says he favors severance pay, so long as it involves no appreciable increase in costs to the Government. There are many ways for employers to shift the cost to the government, and many persons believe that dismissal pay should be directly charged to the termination settlement. Another problem arises in discrimination between war workers and essential civilian workers.

Postwar Shipbuilding

It is a mistake to believe that there will be no shipbuilding industry after the war. The United States does not now have a single passenger ship, though the total American fleet at present is estimated by the Harvard School of Business Administration at 5550 vessels of 2000 tons and over. The Liberty ships are all rather slow for conversion to passenger service. The Victory design, having a speed of 17 knots, can be converted, but for use only in certain classes of traffic. Some of the "C" designs, which are fast enough and built for peacetime operation, will make first class passenger vessels.

But the U. S. merchant marine will want some large ships, in the 25,000 to 30,000 ton class, which are desirable for fast passenger and express traffic. Several designers are already working on modernized streamliners which will try to hold cabin trade from the offshore airlines. The Harvard report says that between 245 and 620 ships will be necessary to the U. S. services within a few years. Of course the need will fall far below the capacity of present yard facilities. The British will bring political pressure to limit the U. S. merchant fleet, and the 1936 ship subsidy act will be up for revision.

Steel Sheet Controls

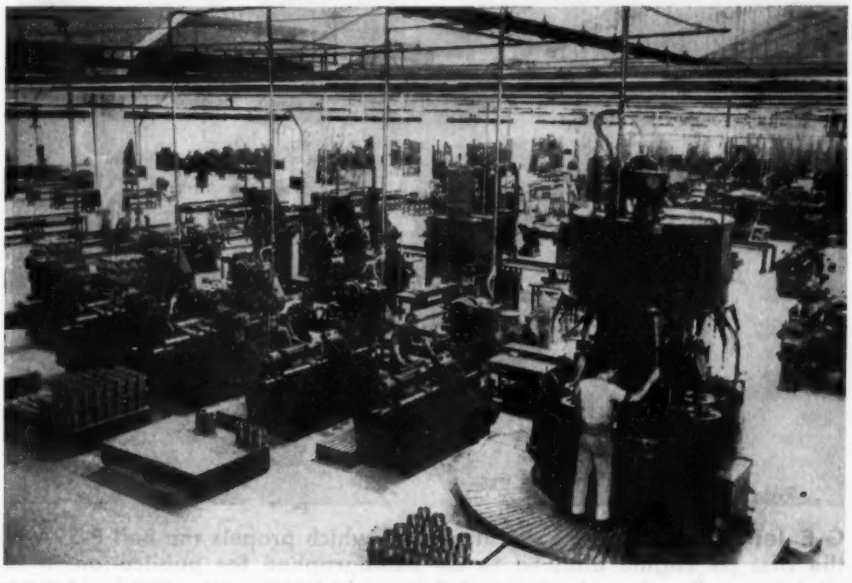
Sheet and strip steel producers have told WPB that if the Controlled Materials Plan (steel, aluminum, copper) were abolished now they could use the resulting flexibility to keep all facilities and manpower in maximum production and to concentrate on orders needed, so that they could schedule about 50 percent of their output. WPB is now scheduling nearly 100 percent of it. Members of the Industry Advisory Committee recently asked that CMP be washed out now, instead of December 31 as planned, and that the proposed "MM" military rating band be substituted at once.

Interesting U. S. Reports

Three reports of interest to members of the metal-working industry have been issued. The first is "How to Do Business with RFC." It outlines functions and procedures and lists hundreds of materials, supplies and equipment for sale, including more than a hundred machine tool items, and a long list of industrial machinery.

Fourth Report of the Director of Contract Settlement, titled "War Contract Terminations and Settlements," says that $16 billion in canceled commitments have been terminated during the year ending June 30; that less than 1300 of almost 15,000 terminated fixed-price contracts pending have been pending over 6 months; that adequate interim financing is available to war contractors; surveys indicate fair compensation has been awarded to contractors; most plants are being cleared promptly. Rate of settlement will have to be greatly speeded up for V-J day.

Likewise the quarterly report of the Surplus Property Board is old, having been signed last May by the three members, including Guy M. Gillette (since resigned) shortly after German surrender. A preamble by A. E. Howse, administrator for the Board, says that war surplus property may total one-third the value of all man-made goods in the United States, from pins to Boulder Dam, which the country contained ten years ago. The report is an excellent treatise on history, theory, policy, and statistics of war excess disposal.



Latin-American Development Will Aid U. S. Trade—This general view of Brazil's first airplane motor factory, located north of Rio de Janeiro, is indicative of the industrial expansion and development going on in Latin-America. Lathes for turning cylinders are shown in the foreground. Cylinders are now cast in the United States, but this Brazilian factory expects to have its own nickel alloy foundry soon

Spotting the Air News

More Jets Ahead

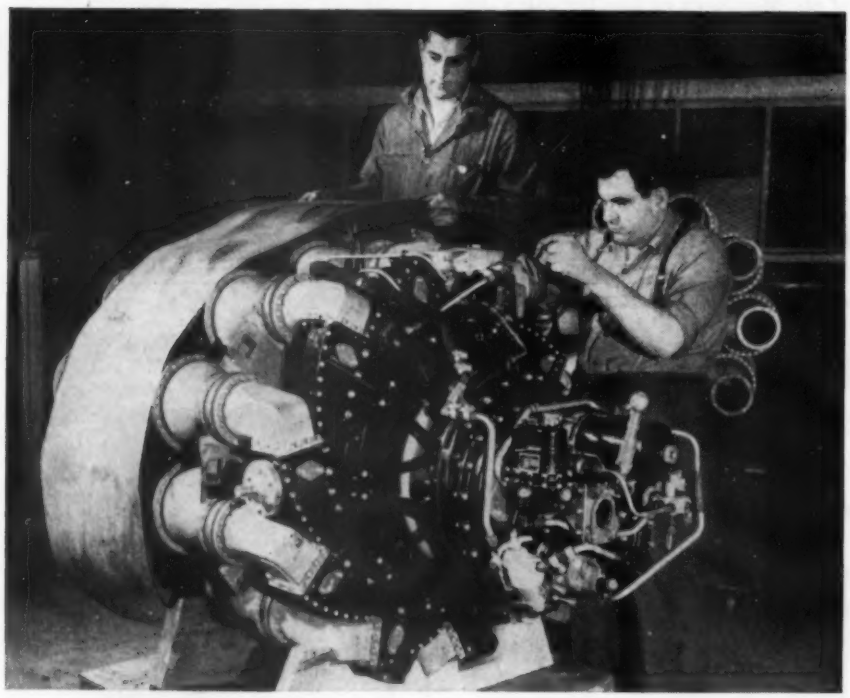
Lockheed's P-80 *Shooting Star* jet propelled fighter, which approaches 600 mph speed, is only the beginning of more space-annihilating fighters in the peacetime future. One problem is to develop air compressor rotors which are capable of withstanding, at high temperatures, the centrifugal force of high speed. The writer has seen jet engine rotors exploded in test runs, with protective housing of several inches of wood, and several inches of steel armor outside. Engineers said that pieces of the broken compressor rotors, weighing a few ounces, had gone through five or six inches of steel. The other obstacle to still more jet plane speed is the compression shock wave on the wings. Further refined, thinner, smoother wing and fuselage design are required. There is a definite limit on airfoil speed. The next step is the wingless rocket.

B-32 Output May End

Belated announcement by the Army that its Consolidated B-32 heavy bomber, intended mate of the Boeing B-29, is in action, lacks significance in view of the fact that production is scheduled for early termination. Whether it was good Air Force strategy to spend materials and manpower on a stand-by heavy design is open to debate. At any rate, the B-32, having been through many difficulties and come out a good airplane, cannot outdo the B-29 on enough points to justify its continuance. One of its features: reversible pitch blades on the two inboard propellers, may prove important in both military and civil aviation. Reversed thrust is an effective braking force; very short runways can be used for landing, and with rocket-assisted take-off. Reverse-pitch braking may hasten the use of larger airplanes on shipboard by taking part of the risk out of present arresting gear. The take-off in this case is assisted by catapults. It's a little speculative right now, but airmen have thought of using reverse thrust in the air in manuevers to outwit the enemy.

Heavy Cuts Due

War officials in Washington are not counting on it, but they all agree that the Jap war could fold any day. If it does, an un-planned stoppage of the aircraft industry, now running at the rate of about a billion dollars per month, will create bedlam, to use a mild word. If the war goes on, cutbacks will come in large chunks. There is now no reason to put new designs into production against the helpless Jap air forces. Navy's new Ryan jet fighter might be stopped before it sees action. Some of the old standard designs still in the fight undoubtedly will be shut off. Amazingly few star performers are still in: Army's P-80, the B-29 *Superfortress*, P-51 *Mustang*, and P-47 *Thunderbolt*, and Navy's *Corsair* F4U, *Wildcat* F6F and *Hellcat* F7F. A demon little F8F, built to do all the things the other Grumman *Cats* do, and yet out-turn the kite-like Jap fighters, is set for action soon. That's about the whole story. Douglas C-54 and Martin's PBM Mariner flying boat seem to have won the blue ribbon in military transport. Others still in, but those are the stars.



G-E Jet Engines—This powerful engine, which propels the Bell P-59A is the first jet engine allowed to be photographed for publication. It is slightly smaller than the Super G-E Jet, which drives the Lockheed P-80 fighters. Just inside the front cover shield is the compressor which whips air to combustion chambers, where fuel burns fiercely increasing the velocity of the air and hot gases, which pass through a turbine wheel and on out the jet exhaust. A shaft connects the turbine and the compressor which it turns thousands of times a minute

Flying Boat Features

Now the Navy is going to demonstrate the flying boat. First unit of an order of 20 Martin *Mars* 72½-ton marine cargo planes was delivered last fortnight and flown same day. About seven more will splash into the Petuxent River seadrome at Middleriver, Maryland, by New Year. If the war folds, Navy will tell Congress it needs all 20 to service islands in the Pacific. The old prototype *Mars* you've been reading about for years, was converted from a patrol bomber. In the past 15 months, it has flown 325,000 miles, mostly between the Mainland and Hawaii, lugging 22,000 pounds of payload per trip. The new production model handles nearly 35,000 pounds, and all characteristics are improved. Martin has over-stressed the *Mars* airframe so he can add more power for postwar civilian service.

Safety Gasoline

Standard Oil (N. J.) has announced a high flash gasoline for aircraft, meaning it won't burn when spilled or released in a crash. It's important, because safety precautions in airplane servicing, and design limitations favoring volatile gasoline, and especially crash fires, on and off airports, are expensive. The catch is that high flash gasoline can be used only by injection, in lieu of carburetion. Europe long since went over to injection, but here we don't like the extra cams and metering and precision. Probably we'll take the trouble though, to escape the terrors of gasoline fires. It has great promise for military use, but research and component materials are not ready for this war.

NEW KAISER-FRAZER CORP.

DETROIT—The new Kaiser-Frazer Corporation has been formed by the Kaiser interests and the Graham-Paige Motors Corporation, who will jointly own the new company. Henry J. Kaiser will be chairman of the board and Joseph W. Frazer will be president and general manager. The company plans to start manufacture early next year of a new lightweight low-priced auto to be known as the "Kaiser." Location will be on the West Coast.

Canadian Labor Shortage Cuts Reconversion Steel Production

MONTREAL — Although consumption of steel for direct war purposes has been curtailed, a demand that continues to "tax capacity to the limit" is reported by the Steel Company of Canada Limited. This is one indication of civilian requirements taking up the slack and is a normal consequence of recent government orders that permit the use of steel for many forms of manufacture prohibited or restricted during recent years. However, the shortage of manpower is still acute, the report notes, and it is hampering the production of civilian goods as well as new construction work.

Canada's capacity to produce iron and steel products of all kinds has shown a notable increase during the war period. Steel capacity is nearly double the pre-war level, and Canada's production of automotive products is three times what it was. A survey conducted by the MacLean Hunter Publishing Company shows that in Canada alone there is a market for $377 millions of electrical appliances, most of them made of steel. An earlier survey revealed that machinery purchases totalling $222 millions were planned by Canadian industry.

There are now more than 2,000 factories using iron and steel in Canada, representing a capital investment of $1,852 millions and employing nearly half a million people.

Reconversion, however, poses certain problems. For example, the shipbuilding and aircraft industries employed together 150,000 persons with about $500 millions capital invested. These two industries showed spectacular gains during the war-building boom and are not expected to maintain anything like their wartime levels. Consequently, maintenance of other steel-using industries at peak, plus expansion in other fields to counteract the drop in shipbuilding and aircraft construction, will have to be achieved. Canadian industry is now working to that end.

British Tool Association Aids Setting up of Research Group

LONDON—E. C. Farrell, president Burton, Griffiths & Co., Ltd., Birmingham, was elected president of the British Machine Tool Trades Association at the annual meeting held recently. J. H. Goddard, of Wadkin, Ltd., was named vice president and treasurer. Three past presidents of the association will serve on the executive committee: Sir Alfred Herbert, K.B.E., chairman Alfred Herbert, Ltd.; H. W. L. Kearns, C. B. E., president H. W. Kearns & Co., Ltd.; and G. S. Maginness, Churchill Machine Tool Co., Ltd. The Machine Tool Manufacturers' Section Committee is comprised of Mr. Clark as chairman; J. Archdale, James Archdale & Co., Ltd; W. P. Eastwood, George Swift & Sons, Ltd.; J. R. Greenwood, Craven Bros. (Manchester), Ltd.; and G. Thompson, H. W. Ward, Ltd.

In his address before retiring as head of the association, Mr. Kearns expressed pleasure that the machine tool industry was collaborating with the Institution of Production Engineers, the National Federation of Engineers' Tool Manufacturers, and the Gauge & Tool Makers' Association in setting up a Research Association qualifying for recognition by the Department of Scientific and Industrial Research. He outlined the measures that had been taken by the government toward a gradual sane decontrol, including the removal of price control and licensing. He pointed out that the association had been fully consulted in these actions, and it was being consulted regarding the industry's future.

Names in the News

Joseph W. Frazer

Joseph W. Frazer, chairman of the board, Graham-Paige Motors Corp., Detroit, Mich., has assumed the presidency of the company, succeeding R. J. Hodgson, who has resigned. **Vern A. Drum** has been appointed vice president and general manager, and W. A. MacDonald has been named vice president in charge of sales.

Bennett S. Chapple, Jr., has been named assistant to vice president-sales, United States Steel Corp., of Delaware. **C. W. Guyatt** has been appointed assistant to **C. D. King,** chairman of operating committees.

Harry A. Feldbush, formerly works manager of the Holyoke, Mass., plant of Worthington Pump & Machinery Corp., Harrison, N. J., has been named vice president in charge of engineering for the entire corporation.

J. H. Deppeler, chief engineer, Metal & Thermit Corp., New York, has been presented the Miller Award for outstanding work contributing to the art of welding by the American Welding Society.

G. Edward Pendray, for the last nine years assistant to the president, Westinghouse Electric Corp., Pittsburgh, Pa., in charge of public relations and education has opened his own office as counselor in management, public relations and education. Mr. Pendray's services as advisor will be retained by Westinghouse.

H. B. Leidy has been appointed manager of Middle Atlantic District Manufacturing and Repair Department, Westinghouse Electric Corp., Pittsburgh, Pa. **R. J. Miller,** former acting manager of the department has been transferred to Emeryville, Cal., as assistant manager of the Pacific Coast District Manufacturing & Repair Department.

Robert W. Morgan has been appointed chief engineer of the Fedders Manufacturing Co., Inc., Buffalo, N.Y. He formerly was assistant chief engineer of the Bridgeport Thermostat Co.

Fred Zulauf, for three years chief of the industrial supplies section of the War Production Board's Machine Tools Division, has been appointed deputy director of the Division. Prior to his appointment a few days ago he was serving as acting deputy. Mr. Zulauf was formerly vice president and general manager of the Van Dorn Electric Tool Company of Cleveland.

George M. Davis

Richard O. Loengard

W. L. O'Brien

F. J. Van Poppelen

George M. Davis was recently made sales manager of the ammunition division of the Western Cartridge Co., division of Olin Industries, Inc., East Alton, Ill.

Richard O. Loengard has been made president of United Chromium, Inc., and **Theodore G. Coyle** and **Hugh D. McLeese** have been elected vice presidents. All have been associated with the company since its inception.

Ray Newman has been appointed assistant resident manager of the Kansas City, Mo., plant of the Fisher Body division of General Motors.

Gilbert Soler, superintendent of the quality control departments at Steel & Tube Division of the Timken Roller Bearing Co., Canton, Ohio, has been named assistant general superintendent of the division.

S. J. Mergenhagen has joined the Pittsburgh, Pa., sales organization of Heppenstall Co.

Ralph R. Root has been selected manager of the electrical manufacturing division of The National Acme Co., Cleveland, Ohio.

John C. Sykora has been made vice-president and director of sales for all divisions of the Portable Products Corp., Pittsburgh, Pa.

E. A. France, son of A. W. France, who founded the France Packing Co., Philadelphia, Pa., is now president and general manager of the firm.

E. C. Salzman, vice-president of Robins Conveyors Inc., Passaic, N. J., will have charge of all export operations, including dealings with foreign affiliates and agents, with headquarters at 70 Pine St., New York.

F. A. Wright has been appointed assistant general sales manager of Cutler-Hammer, Inc., Milwaukee, Wisc., and **F. W. Gilchrist** has been appointed manager of its Indianapolis branch.

W. L. O'Brien has been promoted to manager of the Stainless Steel Division of Jessup Steel Co., Washington, Pa. He had been district manager in Indianapolis, where he joined the organization in 1943.

F. J. Van Poppelen of Fairfield, Conn., has been elected vice president of Salem Engineering Co., Salem, Ohio. For the past 11 years Mr. Van Poppelen has filled executive positions at the Remington Arms Co., of Bridgeport, Conn.

Fred E. Harrell, chief engineer, Reliance Electric & Engineering Co., Cleveland, O., has ben appointed general works manager, and **William R. Hough,** product development engineer, has been named to succeed him.

A. C. Fellinger has been made sales manager, power transmission machinery, of the Link-Belt Co., Chicago, Ill., with headquarters at Indianapolis, Ind. The sale and application of silent chain drives will be headed by **H. F. R. Weber.**

E. L. Stacey, southern Texas representative for Federal Products Corp., Providence, R. I., has moved his office from 3022 Houston Ave., Houston, Tex., to 2148 Dryden Rd., Houston.

Ed P. Phillips of Richmond, Va., has concluded a year's service as head of the Machinery Division of the Office of Surplus Property, Department of Commerce, Washington, D. C., and will return to the full-time direction of his own companies in Richmond, Va., Washington, D. C., and Baltimore, Md.

Carl E. Anderson has been appointed director of industrial relations at the Warren City Manufacturing Co., Warren, Ohio, subsidiary of Graham-Paige Motors, Detroit, Mich.

Nelson Tood has rejoined the Hanson-Van Winkle-Munning Co., of Matawan, N. J., and been re-elected a director in the company.

BUSINESS ITEMS

Allen Tool & Manufacturing Co., Dayton, Ohio, has purchased the tool business of **The Rieger Manufacturing Co.,** Miamisburg, Ohio.

The Geometric Tool Co., New Haven, Conn., has appointed the following distributors in Michigan: **B-H Tool & Supply Co., C. L. Gransden & Co.,** and **The Rayl Co.,** of Detroit; **Gransden-Hall & Co.,** Flint; **Grand Rapids Supply Co.,** Grand Rapids; **C. E. Hamlin & Co.,** Jackson; **Hoover Supply Co.,** Kalamazoo; **Precision Tool & Supply Co.,** Lansing; **Cutting Tools & Supply Co.,** Pontiac; **Port Huron Equipment Co.,** Port Huron.

Square D. Co. Canada Ltd., affiliate of Square D Co., Detroit, Mich., and Milwaukee, Wis., will soon begin operations in its newly constructed plant in Toronto.

Paragon Spring Co., 4615-17 West Fulton Street, Chicago 44, Ill., has been organized by **Harry G. Faust** and **Christie W. Hohe,** both long identified with the spring industry.

Ace Manufacturing Corp., Philadelphia, Pa., has purchased the entire assets of **Delloy Metals,** Philadelphia, and will operate it as **Delloy Metal Corp.**

Ashdale Testing Laboratories, Philadelphia, Pa., announces the opening of its Precision Measuring Laboratory.

OBITUARIES

J. Russell Garrison, 48, president and general manager of the Garrison Machine works, Dayton, Ohio, died July 18 at his home. For 15 years he was head of the machine company, founded by his father.

Edward C. Schwingel, 80, president of the Lake Erie Manufacturing Co., Inc., Buffalo, N. Y., died recently at his home. He came to Buffalo in 1901 and started the company.

George C. Beidler, 67, inventor of the rectigraph, died July 23. He invented the machine in 1902 and five years later organized the Rectigraph Co., which was sold out to Haloid Co. in 1935.

Ernest Redpath, vice-president and general manager, Vancouver Engineering Works Ltd., Vancouver, B. C., was drowned recently near his home, West Vancouver.

Shop Equipment News

Fray Duplex Miller Combines Dual Spindles and Electronic Controls

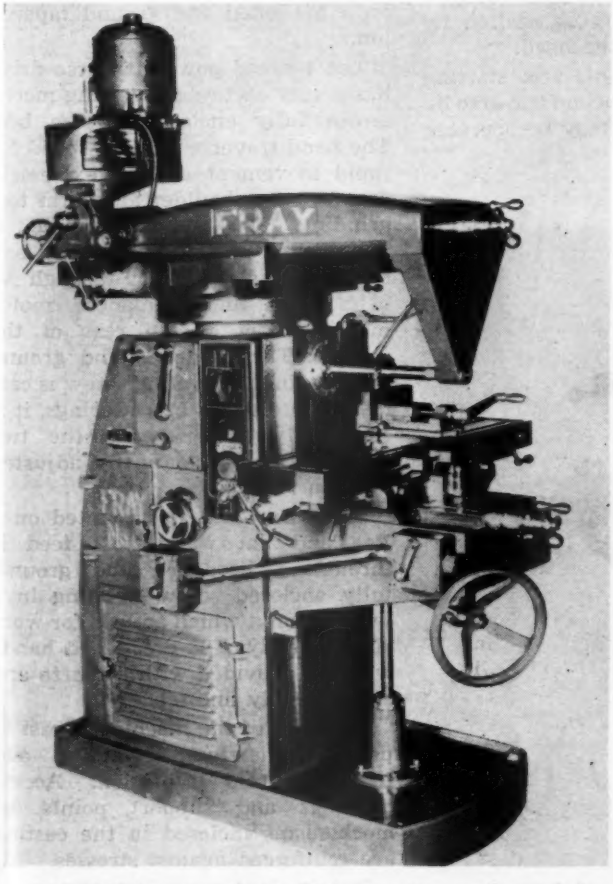
The Fray Machine Tool Co., Glendale, Calif., announces the No. 9 milling machine, a turret head, ram type, built for vertical or horizontal work operations, which has a variable speed to power feed achieved by an electronic control panel, built-in as an integral part of the equipment.

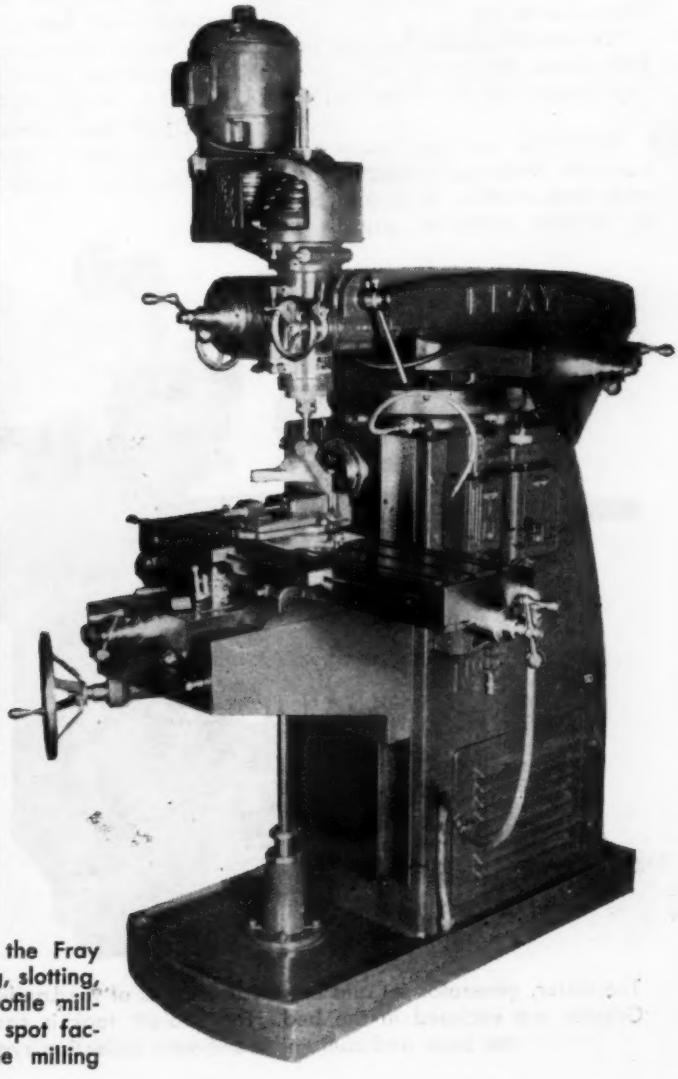
Since it is both a horizontal and vertical precision milling machine, almost any operation at any angle or compound angle can be completed without changing the original work setup. This feature, plus the electronic variable speed control, helps increase work output. This makes possible a greater work flexibility, and increases the milling machine's utility in long run production schedules. The combination tool also provides a greater range of stepless speeds to the horizontal spindle.

The No. 9 is adapted to jobs involving a wide variety of operations on a single piece of work. In such instances it is simpler, faster and more economical to change the machine than to reset the work. The addition of electronic variable speed control also permits increased feed speeds.

Work that would ordinarily require several fixtures and setups on vertical and horizontal milling machines can be completed in one setting, using a single fixture, when set up on the No. 9 Fray duplex milling machine. Either spindle can be swung out of the way to permit use of the other without disturbing the setup, once the fixture has been set

The rigidity and accuracy of the





Work operations which can be performed by the Fray No. 9 milling machine include precision jig boring, slotting, drilling, tapping, keyway milling, end milling, profile milling, die sinking, plastic mold routing, serrating, spot facing, counter boring, punch forming and spline milling

adjusting mechanisms are sufficient to permit the machine to be used for jig boring operations whenever the necessity arises for such operations on work suited to the machine.

Operating units mounted within the column are reached for maintenance through removable access doors in the sides of the column.

One control panel, made by Westinghouse, is the operating focal point of the unit. Design of the unit and location of the control panel make it possible for the operator to handle all adjustments without leaving his position in front of the machine or work set-up. Accidental operation of opposing mechanisms is prevented by electrical interlocking devices in the system.

Specifications for Fray Duplex Miller

Table—Overall	10½×40 in.
Working surface	9½×36 in.
Longitudinal travel (power feed)	20 in.
Transverse (travel power feed)	9 in.
Feed speeds (infinite)	⅛ in. to 10 in. per min.
Knee—Vertical travel	18 in.
Ram—Cross-travel	22½ in.
Longitudinal travel	18 in.
Spindle—National Milling Machine Taper	No. 40
Drive	5 hp.
Arbor	12 in.
Speed (stepless)	50 to 650 r.p.m.
Turret head—Diameter	20 in.
Calibration (both sides of index)	45 deg.
Vertical head—Spindle	No. 9 B & S.
Speeds—6	300 to 3050 r.p.m.
Quill travel	4 deg.
Wheel feed (0.001 increments)	0.050 in.

Landis Tool Universal Grinder Redesigned to Improve Controls

A completely redesigned 12 × 28 in. Universal and Tool Grinder has been announced by the Landis Tool Co., Waynesboro, Pa.

The machine will efficiently handle cylindrical, internal, taper, surface, tool sharpening and form tool grinding.

Headstock design features are: variable voltage, combination live and dead spindle, it is unnecessary to change belts or guards when changing from live to dead spindle; work speeds are controlled by a dial on the front of the machine. The spindle and face plate are mounted on precision preloaded ball bearings; extra work visibility is assured by the low height of the head.

Other improvements are: starting and stopping of work and traverse by single lever, either may be operated independently of the other, also this lever automatically disengages the hand traverse when the table is operated by power. The footstock is fully protected from water and grit. The swivel table has a large inverted V to insure correct alignment of headstock, footstock and various fixtures; table can be swiveled 180 deg. on a hardened and ground tapered pin.

The motor, generator set and electrical controls of the Landis Tool Universal Grinder are enclosed in the bed. The coolant tank is cast integral with the base and contains a sediment collection system

The 4-speed power traverse drive has a very accurate reversing mechanism fully enclosed in the bed. The hand traverse has one speed for rapid movement and an extremely fine feed for shoulder and form tool grinding. The wheel spindle is mounted on precision preloaded ball bearings and is driven through V-belts by a finely balanced motor mounted low at the rear of the column. The hardened and ground wheel spindle elevating screw is carried on preloaded ball bearings, it is completely enclosed and the two piece nut is automatically adjusted for wear.

The wheel slide is mounted on a Vee and flat way; cross feed is through a hardened and ground, fully enclosed screw working in a two piece nut which adjusts for wear automatically. The cross feed handwheel is provided with a coarse and an extremely fine feed.

The base of the machine is cast to provide maximum rigidity and freedom from vibration. Access openings and support points, of mechanisms inclosed in the casting are reinforced against stresses.

The coolant pumping system is equipped with removable filters to collect fine particles that may not be removed by the sediment settling system in the base of the machine.

LODGE & SHIPLEY LATHES AT WORK

SET-UPS ARE EASY.

RESULTS EMINENTLY SATISFACTORY

AT

KING MACHINE TOOL COMPANY

The part being machined in photos is a Feed Train Cluster Gear. Characteristics: 50 Carbon, Chrome Moly, Alloy Steel Forging, 310 Brinell hardness.

Long known for their fine vertical boring and turning machines, King Machine Tool Company, Cincinnati, constantly seeks to improve quality and capacity. As a result, this firm installed a 3A Duomatic—Lodge & Shipley's full automatic lathe.

Here is what King says about their new Duomatic: "This machine has given us eminently satisfactory results. Setups are easily performed, and its facility of operations and uniformity of work make for a versatile and highly productive machine."

This automatic lathe is so advanced in design it assures productive capacity never before obtainable. On the 3A Duomatic, dual tool slides, front and rear—operate singly or together, permit any combination of turning, boring and "in or out" facing operations. No cams are needed, setups are entirely mechanical.

Actually, the Duomatic is like two lathes in one, and can probably replace several of your older, less efficient machines. Write for Bulletin No. 601 (on your company letterhead) or call L & S Engineers for a demonstration on your own work.

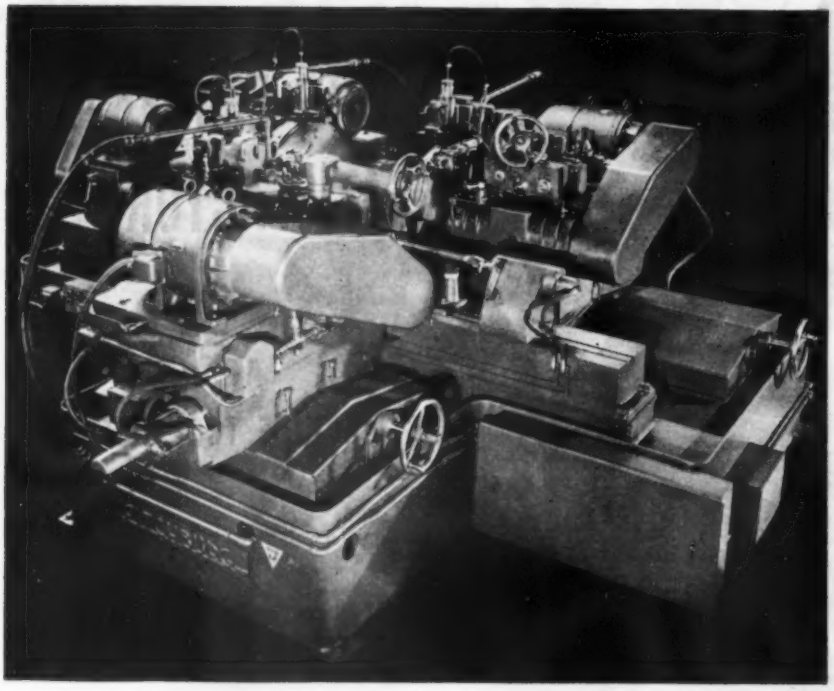
THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

ENGINE—TOOL ROOM—AUTOMATIC—OIL COUNTRY LATHES

Fitchburg Triple Head Grinder Automatically Grinds Torsion Bars



Fitchburg triple head plunge grinder completes all grinding operations on torsion bars in one setting. Finished accuracy of critical sections is improved by the diminishing feed of a bowgage wheelhead

The Fitchburg automatic cycle bowgage wheelhead, manufactured by the Fitchburg Grinding Machine Corp., Falulah Rd., Fitchburg, Mass., is the basic unit in the construction of the triple head plunge grinder used in the manufacture of torsion bar springs for motor vehicles.

The Fitchburg triple head machine performs three complete operations on this torsion bar by the pushing of one button. The three individual, automatic cycle, bowgage wheelheads, approach the work, two from one side, and one from the other, each on a rapid traverse. Upon contacting the work, a grinding feed commences, automatically, grinding the individual spottings. The diminishing feed feature of the bowgage head comes into operation and slows the grinding feed, so that just before coming to absolute size the bowgage head is barely feeding.

At the finish grind position the three heads become stationary and continue to grind until a spark out period is complete. Then, the three heads return to starting position on a rapid traverse and the completion of the automatic cycle has been accomplished. For set-up purposes any one of the three bowgage heads can be stopped in the spark out position and operated by hand, and then made to complete its automatic cycle from the stopping point.

For very close tolerances such as 0.0001 in. and 0.0002 in., a low increment feed with a hydro-electric automatic sizing unit control has been developed which can be attached to any or all wheelheads without altering the grinding speed appreciably.

Although this Fitchburg triple head machine is designed specifically for the accurate finishing of torsion bar springs for motor vehicles, the flexibility of control allows its utilization for articles of similar form. Each wheelhead can be adjusted to perform an individual grinding cycle in sequence with either or both of the others, or the cycles can be made to operate simultaneously.

The provision made for manual operation in the spark-out position permits corrections in any portion of the cycle without altering the functions of other settings.

FITCHBURG TRIPLE HEAD-PLUNGE GRINDER SPECIFICATIONS

Capacity	
Normal swing over table	6 in.
Maximum swing over table	18½ in.
Maximum diameter with 3 in. rapid traverse	6 in.
Maximum distance between centers	96 in.
Height from floor to center	43⅞ in.
Floor space	148 × 179 in.
Headstock	
Range of work speeds	51 to 306 r.p.m.
Taper of center	No. 5 Morse
Work speed drive	V-belt & Chain
Diameter live spindle	3⅛ in.
Footstock	
Diameter of spindle	3½ in.
Taper of center	No. 5 Morse
Type	Lever operated or Hydraulic
Wheelhead	
Size of front bearing	5 × 10½ in.
Size of rear bearing	4⅞ × 10½ in.
Type of plain bearing	Taper adjust. Special Bronze
Spindle lubrication	Pressure feed
Size of grinding wheel	20 × 14 × 12 in. to 30 × 6 × 12 in.
Wheelhead rapid traverse set at factory	0 to 5 in.
Automatic wheel feed	0 to .063 in.
Spindle speed	20 in. wheel—1260 r.p.m. 24 in. wheel—1050 r.p.m. 30 in. wheel— 840 r.p.m.
Spindle drive	Matched V-belts
Size of Motor	15 to 30 h.p. depending on size of wheel
Range of grinding feed rates	Infinite
Dwell or spark-out time	2 sec. to 20 min.

McCROSKY Jack-Lock MILLING CUTTERS

TRADE MARK REG. U.S. PAT OFF.

High Speed, Cast Alloy or Carbide Tipped Blades

for Increased Production, Lower Costs

● You'll get more pieces per day, at lower cost per piece, and need fewer tools to keep a job in continuous production with Jack-Lock Milling Cutters. Originated, perfected, and available only from McCrosky, Jack-Lock Cutters hold the blades rigidly and solidly permitting safe operation at higher feeds and speeds. Easy release of the blades—without hammering—and speedy, uniform adjustment,—permit regrinding with minimum loss of stock,—a particular advantage when carbide tips are used.

Specify Jack-Lock face mills, shell-end, half-side, and staggered tooth cutters for your plant,—and get all the design and operating advantages only Jack-Lock Cutters can give you.

McCROSKY TOOL CORPORATION

MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock MILLING CUTTERS

Block Type BORING BARS

Wizard CHUCKS AND COLLETS

Super Adjustable REAMERS

Turret TOOL POSTS

Thomson Adjustable Drillhead Drills on Close Hole Centers

Thomson Industries, Inc., 29-05 Review Ave., Long Island City, N. Y., announces a 2-spindle type drillhead in which one spindle is built integral with the drive shaft and the other is offset and adjustable for variable

One spindle of the Thomson drillhead is integral with the driveshaft

centers. This permits drilling on closer centers than possible with types in which both spindles are adjustable. The three most popular sizes have spindles provided with ¼ in. capacity chucks, No. 1 or No. 2 Morse taper and are available from standard designs. This drillhead is of full ball bearing construction, having all vital parts completely inclosed and running in grease.

Producto Universal Drill Jig Centers Shafts for Drilling

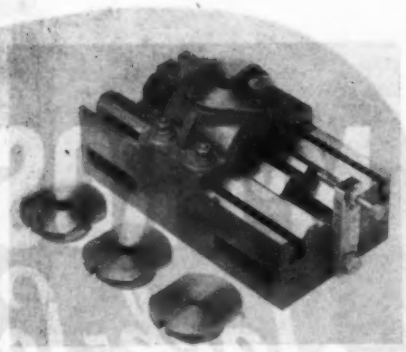
This drill jig has been designed by the Producto Machine Co., 1000 Housatonic Ave., Bridgeport, Conn., for drilling holes in round shafts or spindles and in some cases for square or rectangular parts.

Two hardened and ground V jaws provide for a wide variety of diameters of work, bushing plates provide for a wide range of drill bushing sizes, and provision is made for locating the drill bushing plate bracket to drill a hole at any point within the length of the work.

The base is made of a semi-steel casting with machined and ground surfaces for locating a bracket that holds the interchangeable drill jig plates by a T slot and V grooves.

Within the base is a hardened and ground steel V jaw. Fitted into this major V jaw is a smaller removable hardened and ground V jaw to handle smaller work. A bracket with adjusting screw acts as a stop for locating the work for exact positioning for the drilling. The jig bushing bracket is also fitted with a screw for tightening the work during the drilling operation.

This universal shaft drill jig provides for different diameters and lengths of work, quick positioning for locating the drilled hole, at the same time centering the work properly in a V jaw. This drill jig is usually furnished with 4 interchangeable jig bushing plates with holes of the following diameters: 5/16 in., ½ in., ¾ in., 1 in.—to receive standard drill jig bushings.



Producto universal drill jig is supplied with standard bushing plates

SPECIFICATIONS OF PRODUCTO UNIVERSAL DRILL JIG

Overall length base	12 in.
Width	6 in.
Overall height	5 in.
Capacity—Dia. of shaft	¼ to 2 in.
Sizes of drills	No. 70 to ¼ in.

Baker Machine Processes Rocket Shell Nozzle Plates at Fast Rate

Baker processor for rocket shell nozzle plates is adapted from standard spindles arranged around automatically indexed chucks

A nozzle plate processor for rocket shells is manufactured by Baker Bros., Toledo, Ohio. The basic machine is a standard Baker 26 HO machine, equipped with a special four spindle fixed spindlehead, with fully automatic cycle fixture arranged with four 3-jaw chucks, each chuck automatically indexing. The part handled on this machine is a nozzle plate approximately 5 in. diameter, 1¼ in. thick carrying eight taper holes spaced equally on a circle, with eight holes at an angle on the circle. The fact that the holes are on an angle does not permit multiple drilling with conventional methods.

Four parts are chucked in four 3-jaw chucks, one under each spindle allowing for drilling one hole at a time. The chucks are mounted on angles to allow for drilling on angle in each part. Holes are drilled from solid with special ground twist drills ground to the taper. In handling machine, operator loads four parts, one in each chuck, then pushes buttton for start of cycle. Machine continues in automatic cycle until eight holes in each part are drilled. The work-holding chucks automatically index, cycle of machine is arranged with electric interlock. The cycle can be interrupted in any portion for tool changes or operating corrections.

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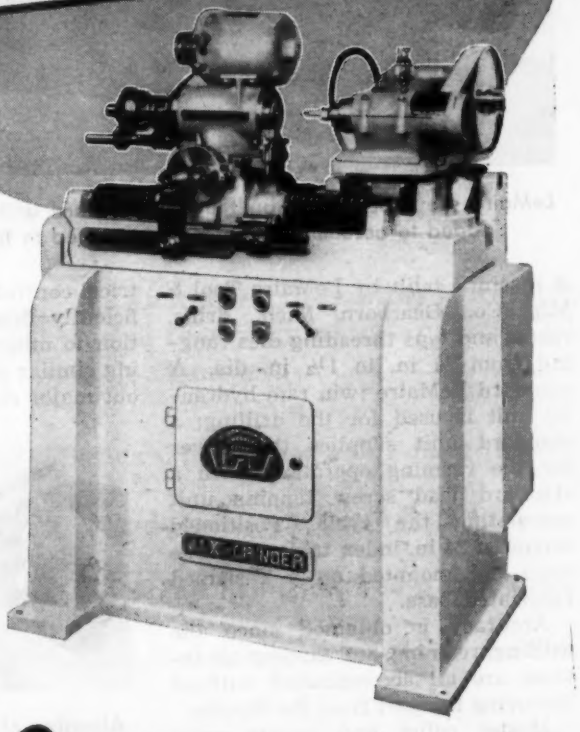
SPEED and PRECISION



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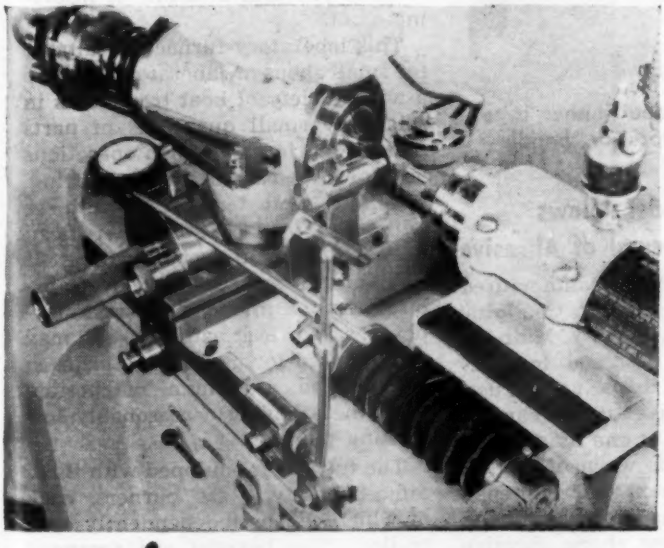
- **Entirely automatic collet opening and closing.**
- **Mechanical differential unit drives grinding-spindle carrier —eliminates bell-mouth holes.**
- **Easily adjusted stroke length adapts unit to shoulder and blind hole grinding.**
- **Six spindle speeds, can be slowed quickly for wheel dressing.**
- **Micrometer feed on diamond wheel dresser quickly adjusted.**
- **Totally enclosed feeding mechanism is free of backlash, protected from dust.**
- **Built in sine bar simplifies taper and angular hole grinding.**
- **Separate motors provided for each operation. Push buttons control all functions.**



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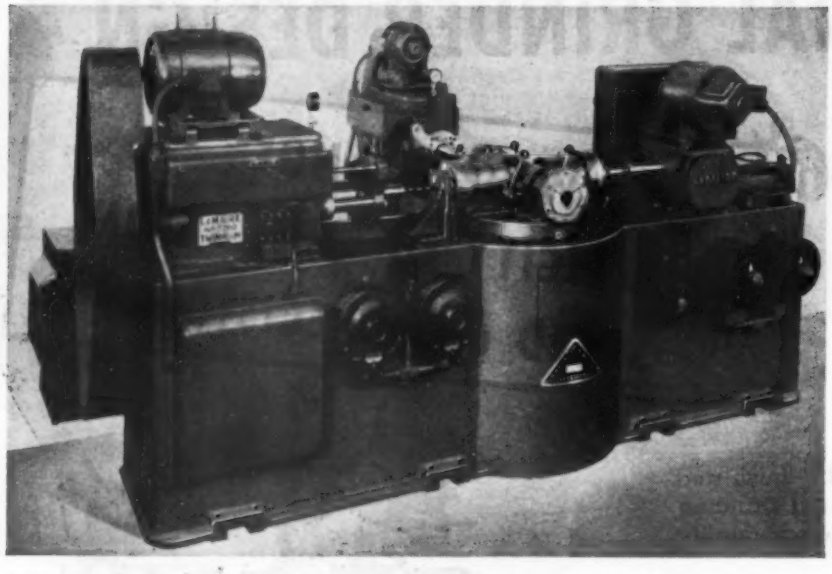
Le Maire Die Processor Performs All Operations in Continuous Cycle



LeMaire die processor is built up of standard units. Attachments can be added to accommodate other parts suited to the machine layout

A machine built by LeMaire Tool & Mfg. Co., Dearborn, Mich., drills, reams and taps threading dies ranging from ¼ in. to 1½ in. dia. A standard LeMaire twin ram hydraulic unit is used for the drilling; a standard unit supplies the power for the reaming operation; with a standard lead screw tapping unit completing the cycle. Positioned around a 24 in. index table, all three units are mounted on a T-shaped fabricated base.

Accuracy is obtained since the drilling, reaming, and tapping operations are all accomplished without removing the part from the fixture.

Master collet and inserts make possible the accommodation of many sizes of dies; and changeover from one size die to another is simple since speeds are infinitely controlled by hand knob and feeds by flow valve. In order to maintain a constant cutting speed, all units are controlled by variable speed motors. A forward push on the gear lever clamps the part in position and a pull unclamps the part and ejects it when the table returns to the front loading position.

The cycle of operation is load, drill, ream, and tap. Production on an average die of ¾ in. thread size is about 83 pieces an hour.

A multiple head can be applied to make this same machine suitable for drilling, reaming, and tapping a number of holes in other parts at one setting. The motors and electrical controlling equipment are sufficiently flexible to permit adaptation to other types of parts requiring similar process operations without major changes.

Abrasive of Handee finisher is renewed from stock on handle

Handee Strip Sander Allows Fast Renewal of Abrasive

The Handee finisher, manufactured by the Master Specialty Co., 5700 Cedar Ave., Minneapolis 7, Minn., is an abrasive tool designed for machine shop as well as production use. Six 12 in. abrasive strips can be placed on the unit at one time. When the outside strip is worn, it can be removed and the next strip tightened in place by means of the knob on the handle. A new sharp abrasive cloth is available whenever desired. The cutting abrasive strip is always kept tight and securely in place on the Handee finisher and accurate control of the abrasive cloth is secured.

Surface Combustion universal furnace is provided with accessories (*a*) muffle, (*b*) protective atmosphere equipment, (*c*) plug and (*d*) pot, to adapt it to requirements of small lots or special heat treatments

Surface Combustion Furnace Combines Three Basic Types

Designed for a variety of applications, a three-way bench type universal furnace is available from Surface Combustion Corp., Toledo 1, Ohio. Controlled operation over a wide range of temperatures enlarges its field of use.

The furnace combines three types of furnaces in one casing. It may be used as a direct-fired oven unit at temperatures from 300 to 2,400 F. For direct heating, a muffle can be placed on the hearth. If an atmosphere is desired, a diamond block can be used in the muffle. A removable plug built into the arch of the furnace provides a means of inserting a pot.

This laboratory furnace is suitable for small shops or laboratories where a wide variety of heat treatments in relatively small quantities of parts must be performed. Such operations as annealing, carburizing, hardening, cyaniding and tempering, with or without a furnace atmosphere, can be handled by the one furnace. It functions as a direct-fired oven, indirect heated muffle, gaseous atmosphere, salt or lead bath type and may also be used for melting metals such as tin, lead, aluminum, magnesium and others having a reasonably low melting point.

The furnace is equipped with three atmosphere-type gas burners, each of which can be independently controlled. The burners are arranged under the hearth to provide uniform heating throughout the heating chamber. A gas pressure regulator assures uniform control of burner operation. Fuel under low pressure without air under pressure is suffi-

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Increased flexibility—now capable of reconditioning taps up to 1-1/2 inch diameter.

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Grinds Chamfer on 2 to 7 flute taps

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Grinds Flutes on 2 to 6 flute taps

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Grinds Spiral Points on 2 to 6 flute taps

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Designed for trouble-free operation . . . all working units sealed against grinding dust . . . interchangeable collets for chamfering, flute grinding and spiral pointing . . . belt-cushioned motorized drive for maximum operating smoothness . . . and other features.

Use the Detroit Tap Reconditioner to multiply life of your taps many times. Ask for Bulletin #DTR-3.

Ground Taps
Thread Milling Cutters
Thread Gages and Special Threading Tools, Machines and Checkers

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cient for burner operation, such as manufactured or natural gas at 3 to 6 in. water pressure, or butane or propane at 9 to 11 in. pressure.

To assure economical application where all the features of the unit are not desired, the muffle and certain other equipment are offered as accessories. Temperature indicators are also in this category, and are available if desired.

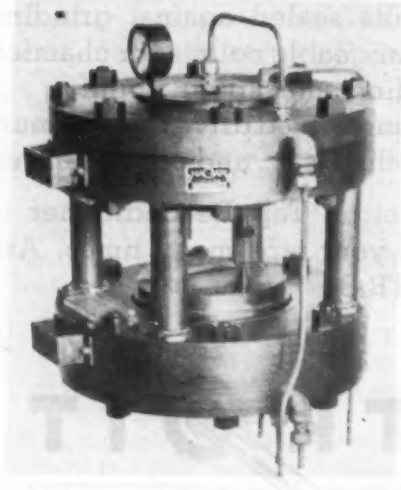
Dimensions are as follows: Hearth width and length, 6 × 12 in., door width and height, 5¼ × 4¼ in., overall dimensions, width 19½ in., length 21⅝ in., height 29 in. Hours to heat from cold to 2,400 F.-2. Maximum gas demand 90,000 B.t.u. per hr.

Thrustorq Measures Force By Comparative Air Pressures

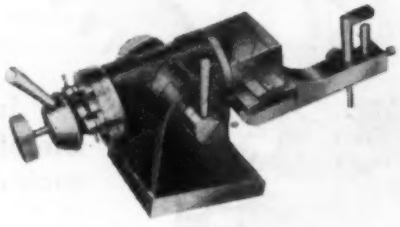
Measuring weight with air has been accomplished by the Hagan Corporation, Pittsburgh, Pa. The heart of the instrument, known as Thrustorq, is a flexible diaphragm which forms one face of an airtight chamber. Compressed air is admitted to this chamber through a poppet type pilot valve. The force to be measured is applied to the outside of the diaphragm and is opposed by internal pressure. As the force increases the pilot valve is opened and admits more air to balance the increased force. As the force decreases, air is exhausted until the external force and internal pressure are equal. Thus the air pressure within the chamber provides a direct measure of the externally applied force.

The response of the instrument is instantaneous because the diaphragm movement necessary to operate the pilot valve is extremely small. Because the force is measured by air pressure, the Thrustorq permits remote reading on any number of manometers, pressure gauges or recording devices.

The fact that the instrument has no intricate mechanisms, knife edges or other parts subject to wear, is said to eliminate maintenance entirely. The Thrustorq will function in any position and, because of its compactness, and the fact that it requires almost no deflection to provide a reading of force, the unit can be used to analyze many structural stress and strain problems. The Thrustorq, once installed, needs no attendant, and with a pressure recording device in the system, a continuous record can be had even at a remote distance. Its construction permits it to be used under conditions where dust, dirt and cramped quarters previously had precluded the making of measurements.



Hagan Thrustorq can operate recorders without loss in accuracy



U. S. Tool radius dresser can be set to correct wheel radii required

U. S. Tool Radius Dresser Sets Directly to Specifications

U. S. Tool and Manufacturing Co., 6906 Kingsley Ave., Dearborn, Mich. are the producers of a precision angle correcting radius dresser that not only does the work of a radius dresser but is also designed to dress the corrected radius on a wheel for grinding compound or compound-complex forms. This tool employs the direct reading principle, eliminating cut and try from this type of wheel dressing. Procedure with this new U.S. Tool Radius dresser is as follows:

Swing the diamond dresser arm mechanism through the specified number of degrees, as indicated on the graduated soale, located at right angles to the dressing axis, and lock in position. (The reading is taken directly from the print and if a 20 deg. relief angle is called for, the dresser is set 20 deg). The radius dresser is then put on the chuck exactly on the centerline of the wheel—and it is dressed to the radius required. For compound-complex angles, the same procedure is followed with the addition of swinging the base of the dresser away from the parallel bar of the chuck, using the upper right hand corner of the dresser base as the pivot point, directly reading the angle (from the blueprint) as before.

Both angle scales are easy to read and easily accessible. All exposed unpainted parts are chrome plated to insure against stain and rust. The dresser is constructed with a hardened tool-steel wear plate on the under side of the base to prevent chipping and wear of the cast iron body. It is fitted with Timken taper roller bearings and a one piece hardened steel spindle arm.

Standard Cutter Line Expanded By Detroit Tap and Tool Co.

A 60 percent increase in the number of sizes of Detroit standard thread milling cutters carried in stock ready for grinding to specifications has been announced by Detroit Tap and Tool Co., 8432 Butler, Detroit 11, Mich. The standard cutters now available include 12 shell type cutters, making a total of 52 shell type standards; and 20 shank type cutters, making a total of 32 shank type standards. All of the shank type cutters are available in either Jarno, Morse, or Brown & Sharpe tapers, as are the original standards.

The expanded line of standards represent, largely, additional sizes as to width of the cutter face and the diameter. These now permit the user to select a standard cutter of either the exact size or so close as to enable economical substitution for all major thread milling operations. The shell type cutters currently carried in stock at Detroit Tap in blank form range from 1½ in. dia. and ½ in. face width to 3½ in. dia. and 2 in. face width, running in ¼ in. steps from the 1½ in. dia. to the 2½ in. dia. inclusive and by ½ in. steps above the 2½ in. dia. The shank type cutters range from ¾ in. dia. and ¾ in. face width to 1½ in. dia. and 1½ in, face width in ¼ in. steps.

To illustrate the range of cutters now available as standard there are for instance, 12 types of 2½ in. dia. shell type cutters with face width of from ¾ to 2½ in. Each of these is available as either topping or non-topping, with full length threads or with plain milling portions at either or both ends.

Detroit standard cutters are available with any thread form for internal or external thread milling.

In our stockrooms, Cadillac Stellite Gages in all standard sizes from No. 6-40 to ¾"-16 National Fine and from No. 6-32 to ½"-13 National Coarse, are awaiting your orders. They are inspected, ready-to-ship and ready-to-use.

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Metalsorter permits immediate comparative qualitative tests to be made without moving the material tested

Metalsorter Idenfities Metals By Metallurgical Differential

The Metalsorter, Type AX, manufactured by Farmers Engineering & Manufacturing Co., 549 Brushton Ave., Pittsburgh 21, Pa., identifies and sorts pure metals, steels and non-ferrous alloys. It is portable, requires no special electrical power supply and makes non-destructive tests on finished products.

The Metalsorter employs the tribo-electric effect. A metallic specimen of standard, known, or acceptable character is rubbed against the surface of an unknown or doubtful piece. If a chemical or metallurgical dissimilarity of the two pieces exists, a minute electrical current is generated and is registered by an indicator on a calibrated scale. When there is no dissimilarity, no electrical current is indicated.

The control unit of the Metalsorter contains a thyratron operated timing circuit, an electronic bias supply and a measuring circuit. A reciprocating tool is connected to the control unit by means of a multiple conductor cable and plug. The tool is provided with a specimen holding chuck and a flexible lead for connection to the metal to be tested.

Various fixtures, tools and connector leads are standard accessory equipment to enable the Metalsorter to use almost any shape of metallic part for a reference standard.

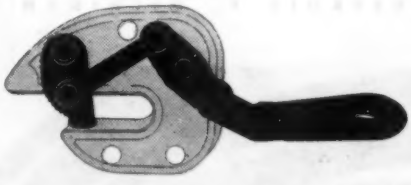
When the Metalsorter is carried from one place to another, the tools and accessories are housed in the control unit cabinet. The entire instrument is enclosed in a canvas felt-lined cover. Weight complete is about 40 lb.

Portability, speed of testing and flexibility of application permits this device to be used on all shapes and sizes in the mill, warehouses, receiving and shipping platforms, laboratory, or production and assembly lines.

Since the test is non-destructive, it may be applied to the identification of built-up machinery and assemblies and structures. The fact that the pieces being tested are in metallic and electrical contact with adjoining members does not affect the accuracy of the test.

Volz Clamp for Flat Surfaces Provides Grip for Lifting

The Volz flat surface lift clamp, manufactured by Merrill Bros., 46-18 Arnold Ave., Maspeth, N. Y., is designed to grip sheet, barrels or structures providing sufficient surfaces, 2 in. or less apart, to permit lifting. The working parts of combined cam and lever types are enclosed in a forged casing and placed to allow operation in a horizontal or vertical position. They are made in four capacities of ½, 1, 3 and 6 tons; all with 2 in. maximum jaw opening.



Jaw of the Volz clamp is designed for maximum lift without indentation

Ideal Electric Marker Design Increases Power 30 Percent

The Ideal marker, manufactured by the Ideal Commutator Dresser Co., 1057 Park Ave., Sycamore, Ill., operates from any a.c. electrical outlet. Operating like a small electric hammer, it makes 7200 cutting strokes per minute. Permanently marks sizes names, numbers and other information on tools, parts and finished product. All parts are enclosed.

For average marking, a hardened alloy point is furnished as standard. If extra hard materials from 54 up to 64 Rockwell hardness scale C are to be marked, a diamond point is recommended. An adjusting nut permits the imprint to be varied to allow marking of any material. Overall length is 6 in., weight 10 ounces.

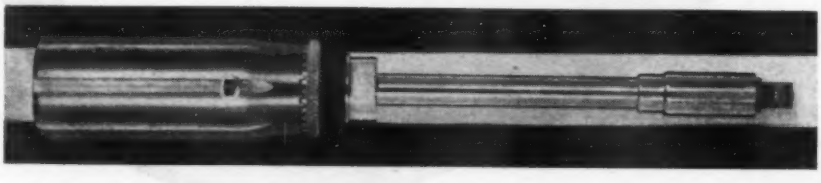
Ideal marker has been designed to balance for easy use in writing

Skyway Torque Wrench Adjusts To Tighten to Precision Limits

The Skyway Tork-Tite, manufactured by Skyway Precision Tool Co., 3217 Casitas Ave., Los Angeles, Calif., incorporates a shaft contained in a light housing and floating in bearings. This design makes possible torque tightening in sensitive inch-ounce settings, for it is impossible to bind the tool by improper use at an angle to the work and thus alter torque. The torque limiting action eliminates possibility of over tightening.

The Tork-Tite is presented in two models with either fixed or adjustable torque setting. The adjustable model is set to a designated torque reading in the handle and secured with a positive locking device at the base of the handle.

The tool is useful where sensitive and definite torque accuracy is required for assembly or laboratory work.



Skyway Tork-Tite wrench cannot be jammed by angular misalignments

Hex units of Lear, Inc. mechanism for operating cowl flaps of mighty Boeing B-29 Superfortress turn on light, sturdy Torrington Needle Bearings. This is one of many Needle Bearing applications on this and other modern aircraft.

Needle Bearings Help Operate Cowl Flaps of B-29 Superfortress

Modern aircraft design requires that each moving part do its job with complete reliability...yet at the least possible cost in energy, space and weight. Hence, on the B-29 Superfortress, it's only natural that part of the mechanisms operating the cowl flaps of the four mighty nacelles turn on light, compact, sturdy Torrington Needle Bearings.

Skillfully engineered for low coefficient of friction, Torrington Needle Bearings are economical in cost, simple to install, retain lubrication efficiently, and handle heavy loads easily. Where specifications call for such benefits packed into the fewest possible ounces of metal, design engineers usually specify Torrington Needle Bearings.

If you design or build aircraft, automotive or related equipment, you owe it to yourself to know the full story of Torrington Needle Bearings in terms of your product. Our Catalog 32 gives full data on types, sizes and applications. May we send you your copy today?

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TORRINGTON NEEDLE BEARINGS

Airco Welding Rod Produces Flat Profile Horizontal Welds

A combination type welding electrode, Airco No. 315, designed to produce horizontal fillet welds with flat or slightly concave profiles and concave fillets in the flat position, as well as deep fillets and deep grooves, has been announced by Air Reduction, 60 E. 42 St., New York 17, N. Y.

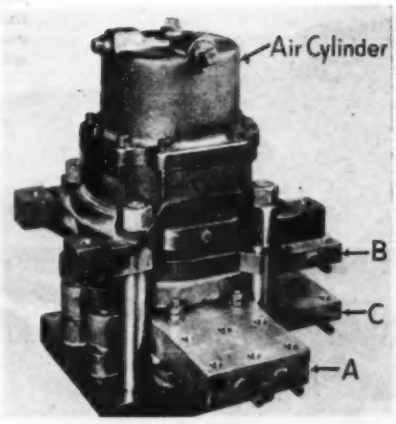
Applications for the electrode include pressure vessels and connections, heavy machine weldments, structural assemblies and heavy steel assemblies where high weld quality is important. The electrode may be used with conventional technique, employing normal currents, under which conditions medium penetration is obtained. Deeper penetration is secured, however, when the deep fillet technique is used with the high currents recommended for this procedure. The rod can be used for any job that calls for a 6020 or 6030 electrode and may be applied with either alternating or direct current, straight or reverse polarity.

Progressive Carbon Contactors Extend Uses for Battery Welds

The contactor-controllers which have made possible the introduction of resistance welding machines operated from storage-batteries as the direct power source, have been released by Progressive Welder Co., 3050 E. Outer Drive, Detroit 12, Mich. These contactors make possible the rapid interruption—without arcing—of welding currents ranging up to tens of thousands of amperes. With this equipment it is possible to weld such materials as aluminum—requiring high current values—in localities where power supply is limited.

Design and operation of the contactor is based on utilization of a well-known electrical principle: the carbon pile rheostat. Such rheostats have the ability to control the current flowing through a circuit merely by varying the pressure applied to a stack of carbon discs. Maximum current flows when the carbon is highly compressed. The current decreases proportionately as the pressure is released.

Instead of having many small discs in series, however, the Progressive contactor-controller is designed so that the current passes from two large carbon discs into a third one which is located centrally between the other two. The carbon pile contactor itself is a heavy duty assembly capable of making and breaking extremely heavy currents continuously. Units in operation interrupt upwards of 30,000 amp. No sparking can be seen between the carbon discs as the current is broken—only an occasional glow from a speck of heated carbon dust.



Progressive carbon-pile contactors for battery-powered welders are built to withstand heavy currents

The contactor consists of the centrally located contact plate having a carbon disc surface top and bottom, facing similar carbon discs mounted on the upper and lower contact plates. When the contactor is to be closed air is admitted to the cylinder above the contact assembly by means of a solenoid air valve. This operates a piston and forces the contacting carbon discs together under a pressure of several thousand pounds.

The four contacting surfaces provide two paths for the flow of welding current through the contactor, thus doubling the capacity of the unit. One is through the bottom contact to the central plate, the other through the top contact to the central plate.

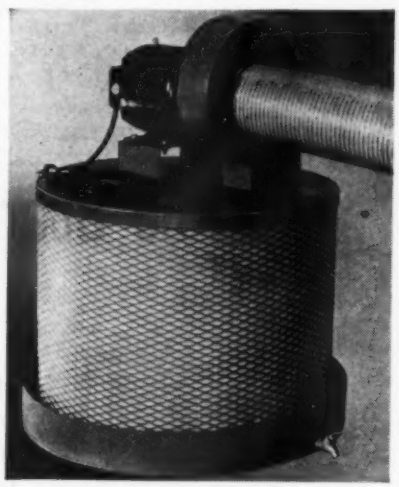
As the contacting surfaces are brought together, they offer, at first, considerable resistance to the flow of the current. This resistance drops rapidly as pressure is applied. Under the full pressure used in battery welding machines, there actually is little resistance to the flow of current.

When the welding current is to be interrupted, the air pressure is simply removed. This action allows springs in the assembly to rapidly separate the contacting surfaces. As the pressure between the plates is thus released, the resistance increases rapidly, so that—as the surfaces actually separate—practically no current remains to be interrupted.

Super-Cut Coolant for Diamond Wheels Prevents Wheel-Glaze

A diamond wheel coolant specially prepared and compounded for use on zurium-bonded diamond wheels has been announced by Industrial Abrasives, Inc., 3724 West 38 St., Chicago 32, Ill. Super-cut coolant clings to the diamond surface and forms a film which prevents hot chips from imbedding themselves between the diamond grains so that wheels can clear without loading or glazing.

It contains no harmful ingredients, is non-irritant, non-toxic, and will not injure the hands or clothing of operators. It is supplied in concentrate form which mixes with 20 parts of water, and can be applied by pump, wick, or drip feed in sufficient quantity to keep the diamond surface fully wet.

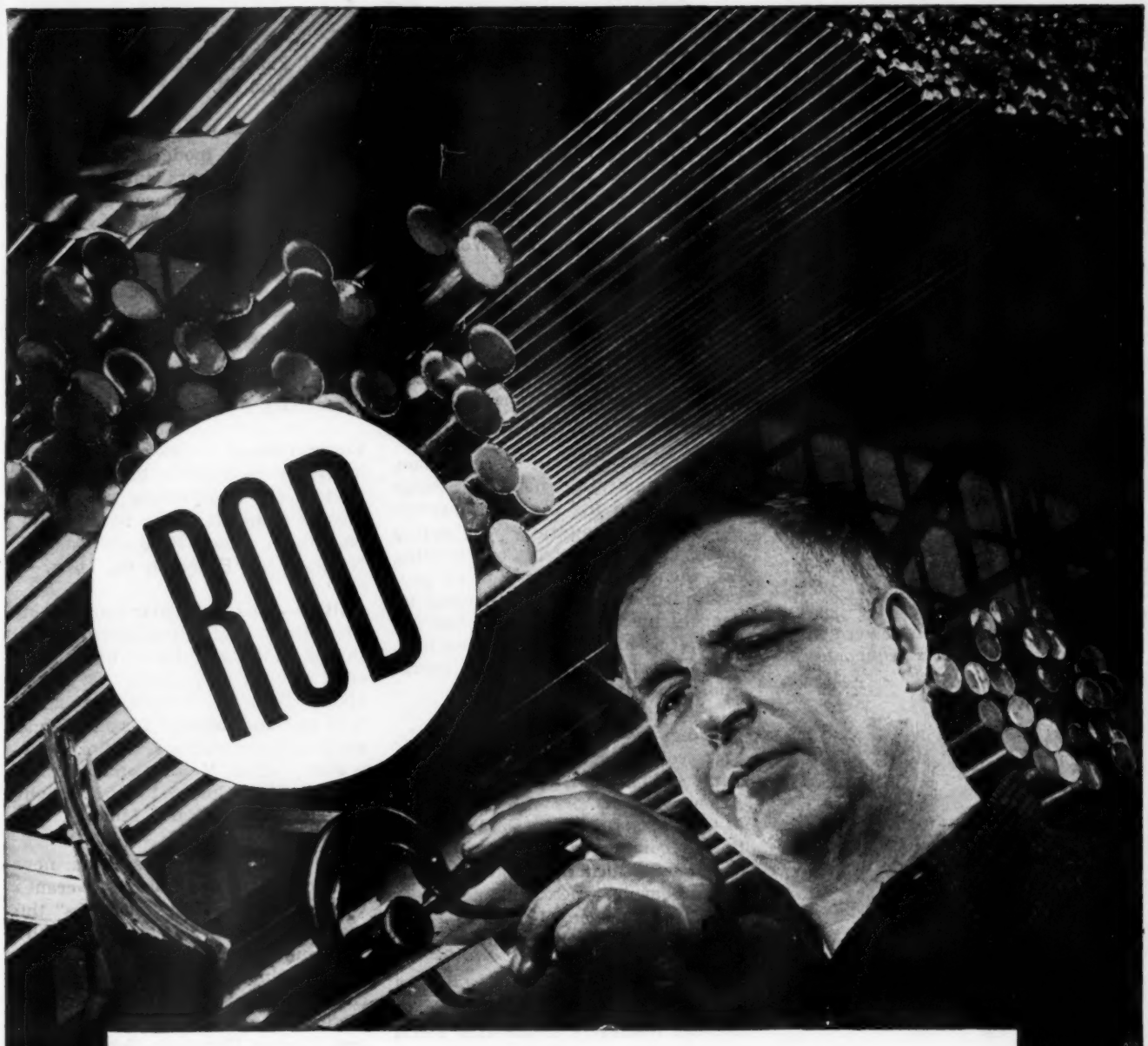


Dustkop powered fume collector salvages oil extracted from mist

Vapor From Cutting Fluids Stopped by Dustkop Filter

A means of collecting vapor from oil or cutting fluids arising from cutting, grinding, and similar operations and returning it to the source is an addition to the line of Dustkops announced by Aget-Detroit Co., Ann Arbor, Mich.

The vapor collector is for use on production machine tools employing cutting oils or coolants such as: screw machines, thread grinders, centerless grinders or wet carbide tool grinders. It employs a multiple-blade fan to draw the vapor from the vicinity of the operator and the work. The vapor laden air is sent against the inside surface of the spun glass filter material where it condenses and is collected in a pan, the cleaned air being recirculated to the



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Revere supplies rod in all the standard sizes and shapes, and in copper and copper-base alloys, magnesium and aluminum alloys. The physical characteristics of finished rod vary with each alloy and with the nature of its processing. Thus it is possible for us to furnish you with rod suitable for practically any desired purpose.

Revere Rod is produced in the following:

Copper	Herculoy (Silicon Bronze)
Free-Cutting Copper	Aluminum Bronze
Free-Cutting Brass	Aluminum-Silicon Bronze
Brass (not free-cutting)	Cupro-Nickel
Red-Brass	Nickel Silver
Naval Brass	Magnesium Alloys
Muntz Metal	Aluminum Alloys
Commercial Bronze	Special Alloys
Roman Bronze	
Manganese Bronze	

Available in coils or straight lengths, depending on size and composition. For full details, prices and deliveries, consult your Revere distributor or us. The Revere Technical Advisory Service will gladly work with you in selecting the rod best fitted for your needs. For this assistance, which is given without obligation, just write the Revere Executive Offices.

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COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

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working space. This collected fluid is returned to the sump or reservoir of the machine tool through the faucet provided on the pan.

Having a suction capacity rating of 500 cu. ft. per min., the collector is capable of stopping all the vapor from machine tools employing cutting or similar fluids which cause vapor and mist.

Installation is made with either ordinary sheet metal pipe or flexible metal hose of 5-in. dia. which fits the inlet flange of the collector and can be located near the source of the vapor. Usually, the collector is mounted immediately behind and above the area of the work so that it is in the best location for catching the vapor.

The standard motor to drive the fan and provide the suction is 1/3 hp., 3450 r.p.m. continuous duty type, for operation on 220 volt, 3 phase, 60 cycle alternating current. Units for operation on power sources of other voltage and frequencies are available.

Bogue fan motor gains rigidity by eliminating blower couplings

Bogue Integrally-Mounted Fan Motor Reduces Blower Weight

This light weight fan motor is designed for use with high capacity blowers. It is simple in construction and employs aluminum extensively. It has sealed bearings which require negligible servicing. Designed for 2 hp. output on 24 volt d.c. it can be adapted for any specified voltage. The motor is self ventilated and will operate continually in any position at high ambient temperatures. The windings are specially designed to match fan characteristics and speeds of 5,000 r.p.m. or higher are recommended. By mounting the motor directly on the blower housing, one end shield is eliminated.

TRADE PUBLICATIONS

Abrasives—Form 2345 describes, illustrates and gives dimensions of abrasive segments used in chucks on many types of machines. Norton Co., 50 New Bond St., Worcester, Mass.

Alloys—24-page book about "The Comparative Foundry Characteristics of Aluminum, Magnesium and Bronze Alloys." By Anthony Cristello, Bendix Aviation Corp., Eclipse-Pioneer Div., Teterboro, N. J.

Bearings—24-page book, part one, bearing application, has 78 drawings and charts giving the fundamentals of bearing mounting, preloading methods, their effect on housing fits, the effect of press fits on preloading, the effect of preloading on bearing life, bearing creep, the use of duplex, shield and sealed bearings. New Departure Division of General Motors, Bristol, Conn.

Bearings — Instruction Sheet No. 3042 covers grease lubrication of anti-friction bearings in Reliance AC and DC motors V-S drives and M-G sets; maintenance and lubrication recommendations for double shield ball, open ball, and spherical roller bearing types. Reliance Electric & Engineering Co., 1074 Ivanhoe Road, Cleveland, Ohio.

Broaching—108-page book designed for engineers, executives and production managers about this metal removing process for mass production. LaPointe Machine Tool Co., Hudson, Mass.

Clamps—Bulletin 110 shows application and gives dimensions of 18 sizes of multi-clamp hose clamps. George K. Garrett Co., Inc., 1421 Chestnut St., Philadelphia 2, Pa.

Condensers—Leaflet W-204-B10 illustrates low level condensers directly attached to pumps, has tabulations giving ratings and dimensions of 14 sizes. Worthington Pump & Machinery Co., 426 Worthington Ave., Harrison, N. J.

Contacts—Form F-411, 32-page about electrical contacts of a variety of shapes and sizes for numerous alloys. Physical properties of contact materials, a selector chart, melting points of metals, dimensions of solid rivet and screw-type contacts with many illustrations of typical assembly methods are presented. Fansteel Metallurgical Corp., N. Chicago, Ill.

Containers — Pamphlet illustrates and explains modern wire-bound shipping containers to save time, reduce costs and conserve shipping room space. Wirebound Box Manufacturers Assn., Theodore R. Sills, 43 E. Ohio St., Chicago 11, Ill.

Controls—16-page bulletin describes and illustrates microact and other electric-type Pyromaster controllers. The Bristol Co., 117 Bristol Rd., Waterbury 91, Conn.

Connectors—A series of nine sheets describes detachable terminal connectors for applications where numerous contacts must be made at one place. Alden Products Co., 117 N. Main St., Brockton 64, Mass.

Cutters—6-page circular contains information and specifications on thread milling cutters, high-speed steel or carbide. Data are given about diameter, number of flutes hole size and keyway for shank and shell type cutters for National, Whitworth, Acme, V and other forms. Plan-O-Mill Corp., 1511 E. Eight Mile Rd., Hazel Park, Mich.

Drives—GEA-4302 tells of a new Maxspeed system hoist for cranes which automatically "measures" the load to be hoisted or lowered at the maximum safe speed, yet prevents the handling of dangerous overloads; can be operated from a.c. or d.c., for indoors or outdoors service. General Electric Company, Schenectady, N. Y.

Equipment—Bulletin A-242 is a supplement to 42 catalog listing new products, changes and corrections about power transmission equipment. Dodge Mfg. Co., Mishawaka, Ind.

Equipment—3 folders giving information about equipment for electroplating, sheet-metal working and machine shop facilities for contract work. Hudson-American Corp., 25 W. 43rd St., New York 18, N. Y.

Fastenings—6th edition of a catalog describes self-tapping screws, masonry nails, wing nuts, socket and thumb screws, damper controls, and a variety of handles. Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

Gears—80-page book about "Modern Methods of Gear Manufacture" tells

TOOL-LIFE UP 2½ TIMES...

PRODUCTION INCREASES 43%

SUNICUT...

Steps-Up Output of Aluminum Pieces from 700 to 1,000 Pieces a Day

One of the war-plants was producing important parts for binoculars and range-finders on a Browne & Sharpe Automatic Type 2-G machine. The operation consisted of boring, threading, forming, and knurling #17 ST 1½" aluminum bar-stock at 1,580 R.P.M. spindle-speed.

The cutting oil used at first did not give them the desired tool-life and production.

Then they consulted a Sun Cutting Oil Engineer who carefully surveyed the operating conditions. He recommended a change to Sunicut. Results . . . output jumped from 700 to 1,000 pieces a day . . . an increase of 43%. Formerly they had reground tools every 100 pieces. Now they regrind after every 375 . . . an increase of more than 2½ times in tool-life.

Machine-tools in large and small plants, like this, throughout the country have demonstrated the superior qualities of Sunicut. Sunicut protects tools, improves finishes, steps-up production. For complete data on Sunicut and Sun's other products for metal-working, call the Sun Cutting Oil Engineer in your territory, or write . . .

SUN OIL COMPANY · ***Philadelphia 3, Pa.***

Sponsors of the Sunoco News Voice of the Air — Lowell Thomas

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OILS FOR AMERICAN INDUSTRY

FIVE BROTHERS founded the Turner Gauge Grinding Company at Ferndale, Michigan, and proceeded to develop an organization of skilled workers backed by the best precision equipment obtainable. Buildings are modern, well ventilated and clean. Superior working conditions generate a superior product. Made here are Cylindrical Plug Gauges, Plast-O-Lock Plug Gauges, Cylindrical Ring Gauges, Special Flush Pin Gauges, Solid Type Snap Gauges, Master Discs and Built-up Gauges.

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TURNER GAUGE GRINDING COMPANY

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The men who make TURNER *gauges*

We believe that the development of the individual and the expansion of our company are *mutually dependent realities.* That is why the men at Turner experience individual freedom and initiative, which in itself, seems to encourage a real desire for cooperation among all employees.

of the design and manufacture of gears. National Broach and Machine Co., 5600 St. Jean, Detroit, Mich.

Generators — Form 245 illustrates and describes many kinds of gas-engine driven lighting plants, generators, and motor generator sets. Kato Engineering Co., 117 Elm St., Mankato, Minn.

Instruments — 24-page booklet describes precision vernier height gages, depth gages, calipers, many types of comparators and indicators, plug, ring and snap gages. American Measuring Instrument Co., 240 W. 40th St., New York 18, N. Y.

Iron—24-page book describes magnetic ingot iron for d.c. applications gives information about the electrical and physical properties of this metal. American Rolling Mill Co., 1939 Armco Avenue, Middletown, O.

Lathes—Catalog 9-G of 36 pages illustrates and describes 9-in. precision lathes in various modifications to suit special purposes and gives specifications. South Bend Lathe Works, 425 E. Madison St., South Bend 22, Ind.

Marking—50-page catalog 103 lists all types of rubber stamp marking equipment; illustrated to show the style of type and the kind of instrument as well as accessories. Louis Melind, 362 W. Chicago Ave., Chicago, Ill.

Microscopes—Bulletin describes industrial microscopes of sturdy construction for accurate measurement of small parts in mass production. Polan Industries, Huntington 19, W. Va.

Milling Machine—"The Milling Machine and its Attachments" is the 83-page Book 2 in the Milling Practice Series. It covers knee and bed types of machines, their attachments and operation. Kearney & Trecker Corporation, Herbert & Gott Sts., Milwaukee, Wis.

Milling Machines—Bulletin 51 of 18 pages describes the planer-type milling machine of the through and open-side types. Bulletin 52 describes and illustrates an open-side milling planer which planes or mills with equal facility. G. A. Gray Co., 3611 Woodburn Ave., Cincinnati 7, Ohio.

Painting—8-page booklet describes and illustrates electrostatic spraying,

You'll probably never need to make one "lone" tool do the work of six different tools but, if necessary, STANDARD Carboloy Tools *could* be quickly and economically adapted in this way to a wide variety of operations. The above example indicates their adaptability.

With Standard Carboloy Tools in your crib, you're prepared to quickly tool-up 60% to 80% of all turning, facing and boring operations. Available in 10 styles (Style T-1 shown), all commonly used sizes, and tipped with grades for cutting steel, cast iron, non-ferrous metals and non-metallics.

Priced as low as 70c—less than the cost of ordinary tools in many sizes—standard Carboloy Tools give you all the benefits of carbide use at minimum tool investment cost. Write for catalog GT-175R.

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Standard Carboloy Tools Are ADAPTABLE to

60%-80%

of your carbide tool needs.

Available in 10 styles.

Priced as low as 70c each.

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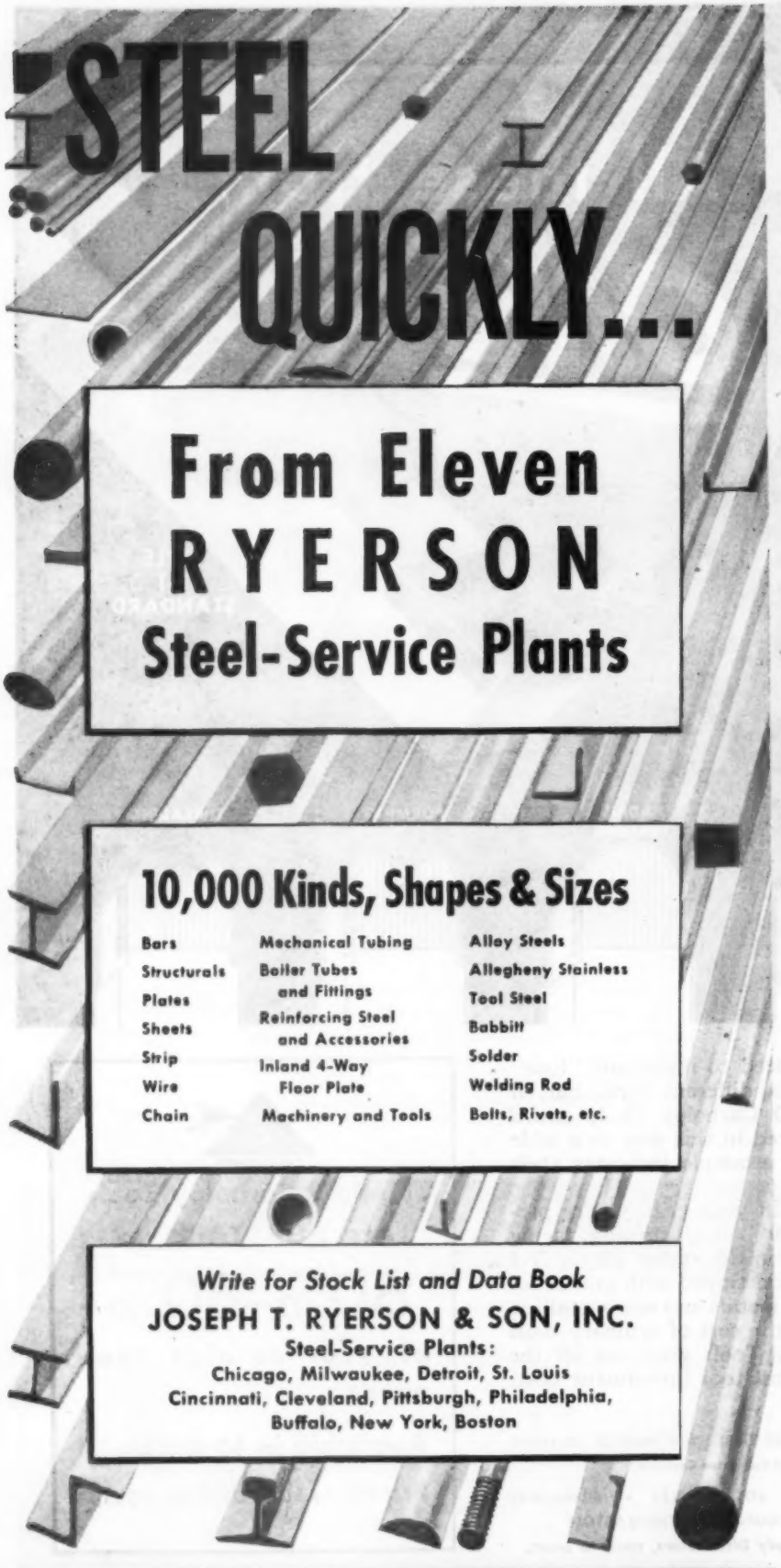
(TRADEMARK) CEMENTED CARBIDE



dipping, detearing and other processes for putting a uniform coat of paint on an object without wasting paint through the use of a high voltage pulsating d.c. of a few milliamperes. Harper J. Ransburg Co., Electric Coating Division, 1200 Barth Ave., Indianapolis 7, Ind.

Paint—Folder describes a paint capable of resisting a temperature of 1,400 F. It is a permanent cover which does not blister or crack at a high temperature. M. J. Merkin Paint Co., Inc., 1441 Broadway, New York, N. Y.

Photography—Bulletin "New Designations for Screens for Cathode-Ray Photography" provides more precise definitions as well as characteristics covering such screens. Allen B. Du Mont Laboratories, Inc., 2 Main Ave., Passaic, N. J.

Plastics—Folder gives information about oil-soluble resins, or industrial resins. There is a table of six groups of resins with their purposes, mechanical and physical properties, for quick reference. Durez Plastics & Chemicals, Inc., 1911 Walck Road, N. Tonawanda, N. Y.

Plastics—Engineering manual about Consoweld which provides authoritative engineering information, processing specifications, and standards data on high-strength plastic materials in many forms. Consolidated Water Power & Co., Plastics Div., Wisconsin Rapids, Wis.

Plating—8-page leaflet describes the uses of the Udylite process to obtain bright nickel plating. Udylite Corporation, 1653 E. Grand Blvd., Detroit 11, Mich.

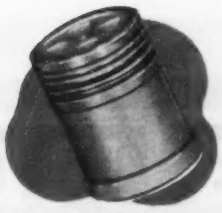
Pumps—Bulletin 1181 describes all the deLaval products such as steam turbines, helical gears, centrifugal pumps, centrifugal compressors, worm gear speed reducers and IMO oil pumps. The manufacturing equipment is explained. De Laval Steam Turbine Co., Trenton 2, N. J.

Oil Purifier—Bulletin 445 presents information on an Aridifier for removing oil, water and dirt from compressed air. It employs centrifugal force caused by multi-blade rotors made of a durable plastic; adjacent rotors revolve in opposite directions. Logan Engineering Co., 4900 Lawrence Ave., Chicago, Ill.

Rivets—Manual D-45 gives a picture of what Cherry rivets are and can do and the different types and alloys are described in detail. Hand and

INSPECTION COSTS REDUCED TO

PENNIES PER PIECE!



This piston has 9 critical dimensions. Both upper and lower limits of every dimension have to be checked.

This part could be checked by 9 inspectors (one for each dimension) using fixed size gages. Each inspector would then need two gages: one for the GO limit, one for the NO GO limit. That means two operations for each dimension—or 18 operations in all.

With a Multichek one operator inspects *both* limits of *all* dimensions in just one pass, and about as fast as 9 inspectors can check simultaneously one limit of any single dimension. Inspection cost is reduced to a mere fraction of the cost by any other method—pennies per piece.

That's not all. The Multichek, because of its inherent mechanical accuracy and positive electrical speed, eliminates the element of human error. No highly developed sense of feel is required to check to a high degree of accuracy. Furthermore, full manufacturing tolerances may be utilized. Multicheks may be used at the machine to control the process, to tell the operator "where he is" and which way "the machine is going"—or they can be used at any inspection station.

May we analyze your requirements and quote on Multicheks for checking from two to twenty or more dimensions simultaneously in one quick pass, thus reducing production costs to a minimum.

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Dayton 1, Ohio, U.S.A.

MACHINE TOOLS · GAGES · MEASURING INSTRUMENTS · CONTRACT SERVICES

ELLSTROM

CHROMIUM PLATED

ROUND GAGE BLOCKS NOW AVAILABLE

Doubles the Gaging Surface

AVAILABLE in three standard degrees of accuracy—"working sets" with a guaranteed tolerance of plus or minus .000008 inch per inch of gage, "inspection sets" with a guaranteed tolerance of plus or minus .000004 inch per inch of gage and "laboratory sets" with a guaranteed tolerance of plus or minus .000002 inch per inch of gage.

1. When you use the new Ellstrom round gage blocks, practically *all* of the gaging surface can be utilized because there are no corners, as in the case of the rectangular or square blocks. For example, the gaging area of a round block is .9970 square inch while the gaging area of a rectangular block is .4968 square inch. Gage life is thereby increased.
2. Chromium plating increases gage life many times over ordinary steel gage blocks.
3. Use of the round shape gage virtually eliminates chances of tipping, causing possible injury to the gaging surface. "Flats" prevent rolling.
4. Gage quickly returns to room temperature after handling, because of center holes.

ROUND GAGES
PRICES PER SET

Set No. 2-85-W	$464.00
Set No. 2-85-I	695.00
Set No. 2-81-W	437.50
Set No. 2-81-I	656.25
Set No. 2-35-W	222.50
Set No. 2-35-I	318.75
Set No. 2-36-W	259.35
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DEARBORN GAGE CO. 22035 BEECH STREET DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

THE CHROMIUM PLATED
ELLSTROM GAGE . . .

. . . ACCURATE TO ± .000002"

pneumatic guns are illustrated and described with their various modifications. Cherry Rivet Co., 231 Winston St., Los Angeles 13, Calif.

Rivets—Bulletin 451, a 16-page manual about Huck Blind Rivets. Instructions and data are given about selecting the proper length, drilling and dimpling of the material, driving the rivets and inspection. Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, Mich.

Rubber—Two booklets, A-4547-A a 14-page technical service manual about Fairprene coated fabrics and A-4548 Fairprene sheet stocks (without fabric inserts) give information about the properties of this synthetic elastic. E. I. duPont de Nemours & Co., Inc., Fabrics Division, Fairfield, Conn.

Rubber—18-page book reviews the steps in the manufacture of Hycar Synthetic rubber. Several tables give physical, mechanical, electrical and chemical properties. Hycar Chemical Company, Akron, Ohio.

Salt Bath—Bulletin U-212 describes a fast-acting electric starting coil for thawing out electric salt bath furnaces that have frozen up. A transformer is connected to the coil. Upton Electric Furnace Div., 7450 Melville at Green, Detroit 17, Mich.

Tools—Bulletin D-45 of 20 pages describes a line of form tools and relieved form cutters for gears, threads, worms, splines, and miscellaneous forms. Colonial Tool Co., Ltd., Windsor Ontario.

Valves—Bulletin 44-7 describes and gives dimensions of many kinds of pilot valves of the rotary, plunger and solenoid plunger types. Vickers, Inc., 1400 Oakman Blvd., Detroit 32, Mich.

Vertical Turret Mills—12-page bulletin about Rogers "Perfect 36" vertical turret mill; illustrations show the machines set up for various operations. There is information about the feeds of the main and side heads and the spindle speeds. Rogers Machine Works, Inc., 1807 Elmwood Ave., Buffalo 7, N. Y.

Welding—Bulletin EW-20 is a four-page folder about new developments in production welding. There is a table of data about the alloy and flux for steels, copper, brass, bronze, nickel and alloys, aluminum and alloys. Eutectic Welding Alloys Company, Department A-3, 40 Worth St., New York 13, N. Y.

Welding—Bulletin 67 of four pages describes the facilities for producing assemblies of bronze sheet, castings or extruded parts welded with Ampco-Trode aluminum bronze weldrod. Ampco Metal, Inc., 1745 S. 38 St., Milwaukee 4, Wis.

X-Ray—Bulletin No. 1245 describes X-ray diffraction apparatus and applications. Picker X-Ray Corp., 300 4th Ave., New York 10, N. Y.

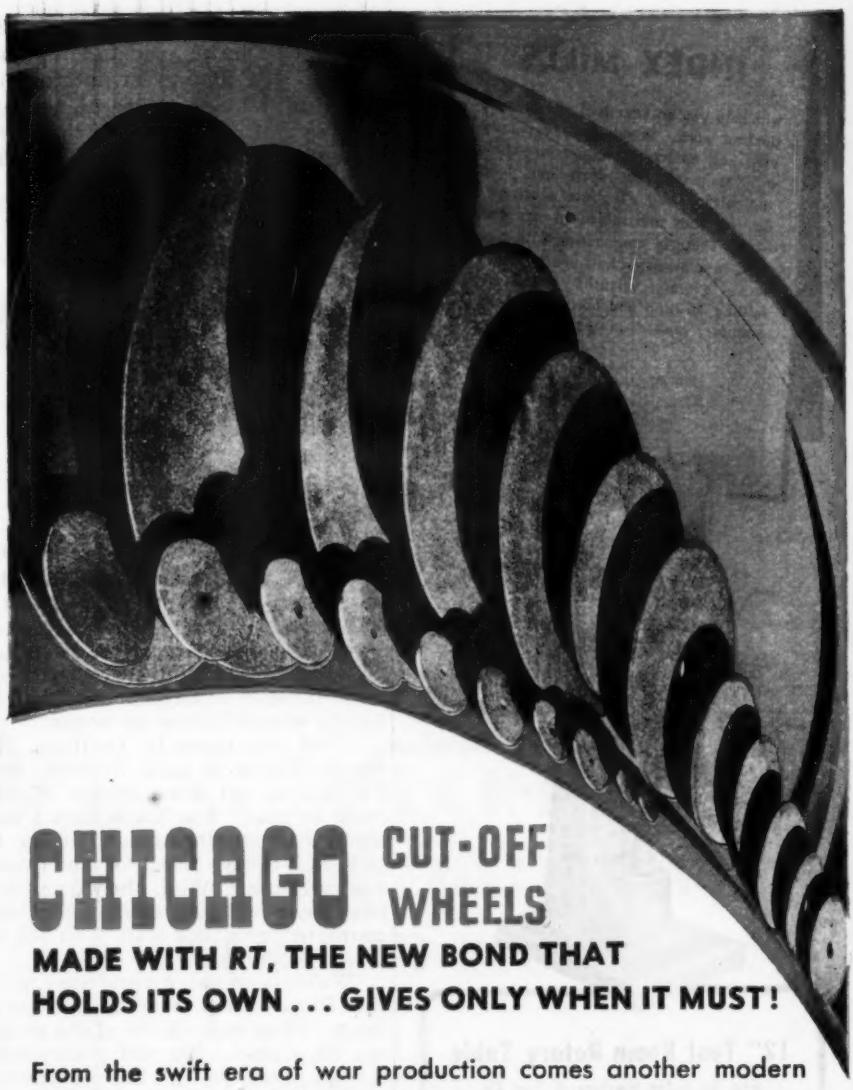
NEW BOOKS

THE BOGEY OF ECONOMIC MATURITY—*By George Terborgh. Published by the Machinery & Allied Products Institute, 221 North La Salle Street, Chicago, Ill. 263 pages. $3.*

The theory of "economic maturity," i.e., that our economy is senile and can no longer maintain itself without government support has been embraced by New Dealers to justify deficit spending and "pump priming." Its constant repetition has resulted in its acceptance by many people, who take for granted further government intervention in business, higher taxation, and continued deficit spending.

The author, who is Research Director of the Machinery & Allied Products Institute, examines this theory and stamps it as a "bogey," after effectively demolishing the arguments advanced by its leading supporters. The vital report made in this book will give the reader renewed faith in our national economy, and substantial ammunition to counter any arguments raised by the stagnationists. The theory is picked apart with considerable logic, based upon careful research and exhaustive analysis.

Readers will long remember the author's story of the conflicting ideas on the future of America held by national economic committees in 1929 and 1939. In 1929, after one of the most prosperous periods in American history, the President's Committee on Recent Economic Changes predicted endless prosperity, saying ". . . economically we have a boundless field before us." Ten years later, after one of the worst depressions in the nation's history, the Temporary National Economic Committee heard testimony from Administration witnesses to the effect that our economic system was senile and decrepit. Both opinions were obviously influenced by the periods through which the na-



CHICAGO CUT-OFF WHEELS

MADE WITH RT, THE NEW BOND THAT HOLDS ITS OWN . . . GIVES ONLY WHEN IT MUST!

From the swift era of war production comes another modern miracle, the cut-off wheel—man power and man hour saver—for the fastest, smoothest method of cutting tubing, wire, steel and brass sheets, glass, porcelain, Stellite, tungsten, plastics, laminates and other hard-to-slice materials.

When RT, the special formula bond was developed, it put the cool-running CHICAGOS 'way out in front in real performance records.

Available in rubber or resinoid—a full range of styles and sizes. 3 bond types—for every operation.

WANT TO TRY ONE? Tell us what you have to cut, grinder you use and size wheel you'd like. We'll send a test wheel promptly.

Write for Cut-off Wheel Circular

CHICAGO WHEEL & MFG. CO.

Originators of the famous Chicago Soft Rubber Polishing Wheels

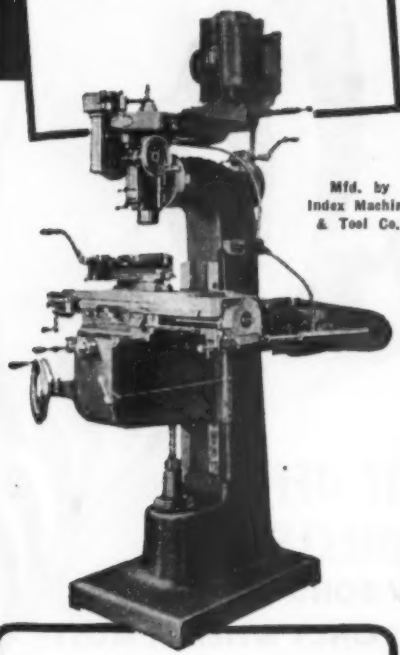
1101 W. MONROE ST., DEPT. AT CHICAGO 7, ILL.

☐ Send Circular
☐ Send Test Wheel
Size .....
To Cut .....

Name .....
Address .....
City ..... State .....

INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Machine & Tool Co.

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.

tion had come up to 1929 and 1939.

Believers in the private enterprise system will find great interest in, and can make good use of, the extensive research and statistical evidence in its defense presented in this book.

"Specs" That Hinder the War Effort

BY JOHN R. GODFREY

OLD MAN JOHNSON has been handling a lot of war contracts for the past three years, but I've seen little of him. So I dropped into his office for a chat last week. He was so full of some of his latest experiences with military contracts that I was hardly seated before he began:

"Glad you came in, Godfrey, old man. You're a good listener, and I've got to get some things off my chest or bust. You know how I feel about fool specifications that try to tell you every detail of the work you're doing? Well, the Army has bust loose with an epidemic of accountants now that can do a lot to delay production.

"We've been doing some work with the Hogan shop over in the next town. They make parts of the product we supply. We had a very nice set-up, sort of a three-cornered affair with the Army inspector in the middle. He's a nice guy and really interested in winning the war. So he'd go to the Hogan shop, inspect the parts they made, bring them to us, and then inspect the completed units in our plant.

"Next thing we knew, the sharks in the accounting department of the Army messed up the whole deal. They said the contract called for Hogan to deliver the parts to us, in heavy wooden boxes. Consequently, the inspector had no right to bring them over and especially not in the cardboard cartons. And all because someone had made fool specifications which Hogan hadn't thought to cross out of the contract.

"Here's another one for the book, Godfrey. The shop next door is making some things for the Navy out of a material which is impervious to weather. They could stand outdoors in any climate for months and be perfectly OK. But the specifications say they must be wrapped in water-proof material, sealed with a waterproof tape and shipped in a box lined with waterproof material. The sad part of it is that the wrapping and boxing costs about four times as much as the thing inside, which doesn't need protection anyhow."

"YANKEE"

TOOLS

also make friends

Vast throngs of new shop workers, trained in war industries, have been using "Yankee" Fine Mechanics Tools for the first time . . . mastering fresh trade skills which will stand them in good stead in the peace years to come. They have learned what skilled mechanics and old-time factory men have long known . . . that "Yankee" Tools complete innumerable tasks *faster, easier,* and *better.* For half a century, the ingenuity of "Yankee" Tools has set a high record in speed and accuracy. The war has served to underscore that record.

Order from your industrial supply distributor, or write North Bros. Mfg. Co., Dept. AM-845, Phila., Penna.

"YANKEE" SPIRAL SCREW DRIVER No. 130A
A Size for Every Purpose

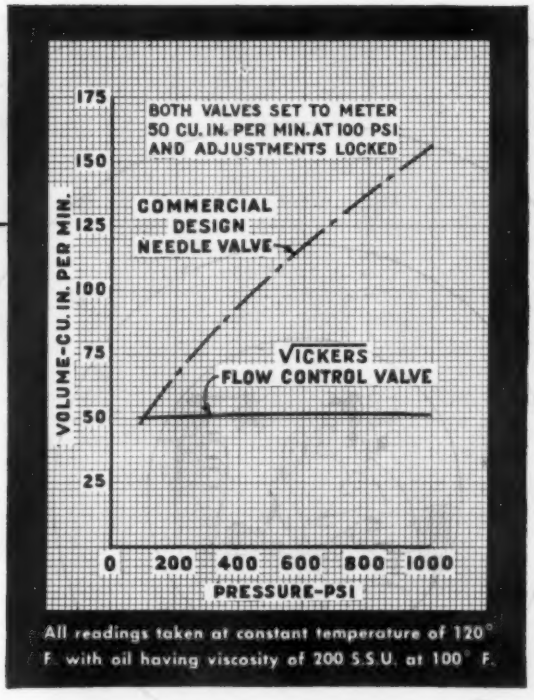
"YANKEE" TOOLS
make good mechanics better
North Bros. Mfg. Co., Phila. 33, U. S. A.
Established 1880

Makers, also, of "Yankee-Handyman" Tools

CONSTANT FLOW RATE

REGARDLESS OF VARIATIONS

IN FLUID PRESSURE



All readings taken at constant temperature of 120° F. with oil having viscosity of 200 S.S.U. at 100° F.

VICKERS

FLOW CONTROL AND OVERLOAD RELIEF VALVES

In hydraulic control systems, this valve combines the functions of a flow control valve with an automatic relief valve to save space and simplify installation. It maintains a constant "metering-in" flow rate (for a given setting of the control adjustment) regardless of any variation in imposed fluid pressure resulting from changes in work resistance. Pump operates only at pressure required to do the work at hand; relief valve is independently adjustable and limits the maximum system pressure to any desired value.

This valve combines in one unit the means for accomplishing three independent functions: (1) adjustable control of flow rate in the hydraulic circuit, (2) adjustable overload pressure protection in the hydraulic system, and (3) remote "Start and Stop" control when used with suitable pilot valve. See Bulletin 40-22 for complete information. Vickers Application Engineers will gladly discuss with you how "hydraulics" can be used to your advantage.

VICKERS *Incorporated*

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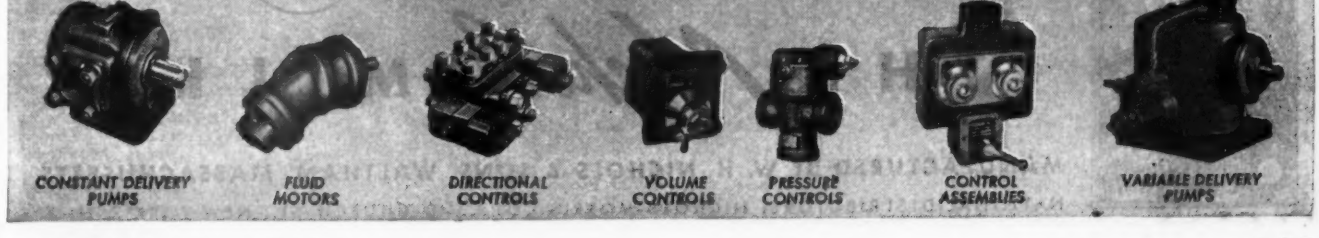
Application Engineering Offices: CHICAGO • CINCINNATI • CLEVELAND • DETROIT • LOS ANGELES • NEWARK • PHILADELPHIA • ROCHESTER • ROCKFORD • TULSA • WORCESTER

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function

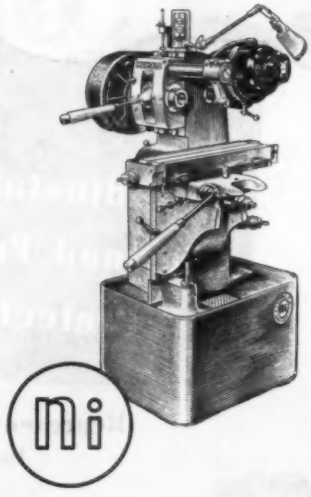


Calling SURGERY

The second Nichols Miller ever made was "Called by Surgery," and is still on the job producing surgical instruments.

The production of surgical instruments demands accuracy, fine finish and the ability to machine unusual forms. The Nichols Miller is designed for such work. Contour milling is done easily with the rise-and-fall spindle. The Nichols can do conventional milling, grinding, turning and boring just as easily—any job within its capacity requiring tolerances to "tenths."

Your products may not be surgical instruments, but your problems in production are the same. A Nichols Miller is the answer.



This new catalog on the Nichols Miller is free for the asking.

THE *Nichols* MILLER

MANUFACTURED BY W. H. NICHOLS & SONS, WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS: NICHOLS-MORRIS CORP., 40 CHURCH ST., NEW YORK 7, N. Y.

FAST DELIVERY NOW....

ON PRECISION WORM GEARS AND LEAD SCREWS TO YOUR SPECIFICATIONS

Parcell and Bauer's ample facilities, modern equipment and experience assure you of FAST DELIVERY on worm gears and lead screws in large or small runs.

Precision Thread Grinding Equipment that holds rigid tolerances on every piece of stock assures uniform precision products at a price comparable to ordinary instock items.

HERE'S WHY YOU CAN DEPEND ON P&B WORMS AND LEAD SCREWS—

- Precision Ground
- Fast Delivery
- Ample Facilities
- Modern Equipment
- Experience

Speed your jobs by specifying P&B Precision Ground Gears and Screws. Just send a blueprint of the part and the quantity . . . we'll quote quickly.

PHONE, WIRE, WRITE TODAY!

Parcell & Bauer PRODUCTS COMPANY

8016 PRAIRIE AVE. DETROIT 4, MICHIGAN

BURRS NO LONGER SNAG!

Before Phillips Recessed Head Screws were used for trim and seat assembly in this motor bus, burrs on slotted screws snagged passengers' clothing, caused many nuisance complaints. In spite of extra time for slow hand driving, and smoothing heads, some burrs got by.

NO ASSEMBLY LAG!

With Phillips Screws, burr-trouble ended, and *savings* began – as much as 40% in assembly time and labor, because power driving became practical. Also saved was the time formerly wasted disassembling, refinishing, and reassembling parts scarred by driver skids.

PLANS GET O.K. TAG!

Because Phillips Recessed Head Screws take heavier driving pressures without danger of burring, driver skids, or slant driving, fastenings are stronger, more rigid than with slotted screws. Designers are freed of slotted head handicaps, can often reduce number of screws needed.

APPROVAL'S "IN THE BAG"!

Burr-free Phillips Screws are not only kind to clothing... the Recessed Head on exposed surfaces looks better, blends with the practical smartness of modern design. Give your product this cost-trimming, customer pleasing sales appeal!

It's Phillips — the engineered recess!

In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

... It's the exact pitch of the angles that eliminates driver skids.

... It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

... It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% – cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

Made in all sizes, types and head styles

25 SOURCES

American Screw Co., Providence, R. I.
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Central Screw Co., Chicago, Ill.
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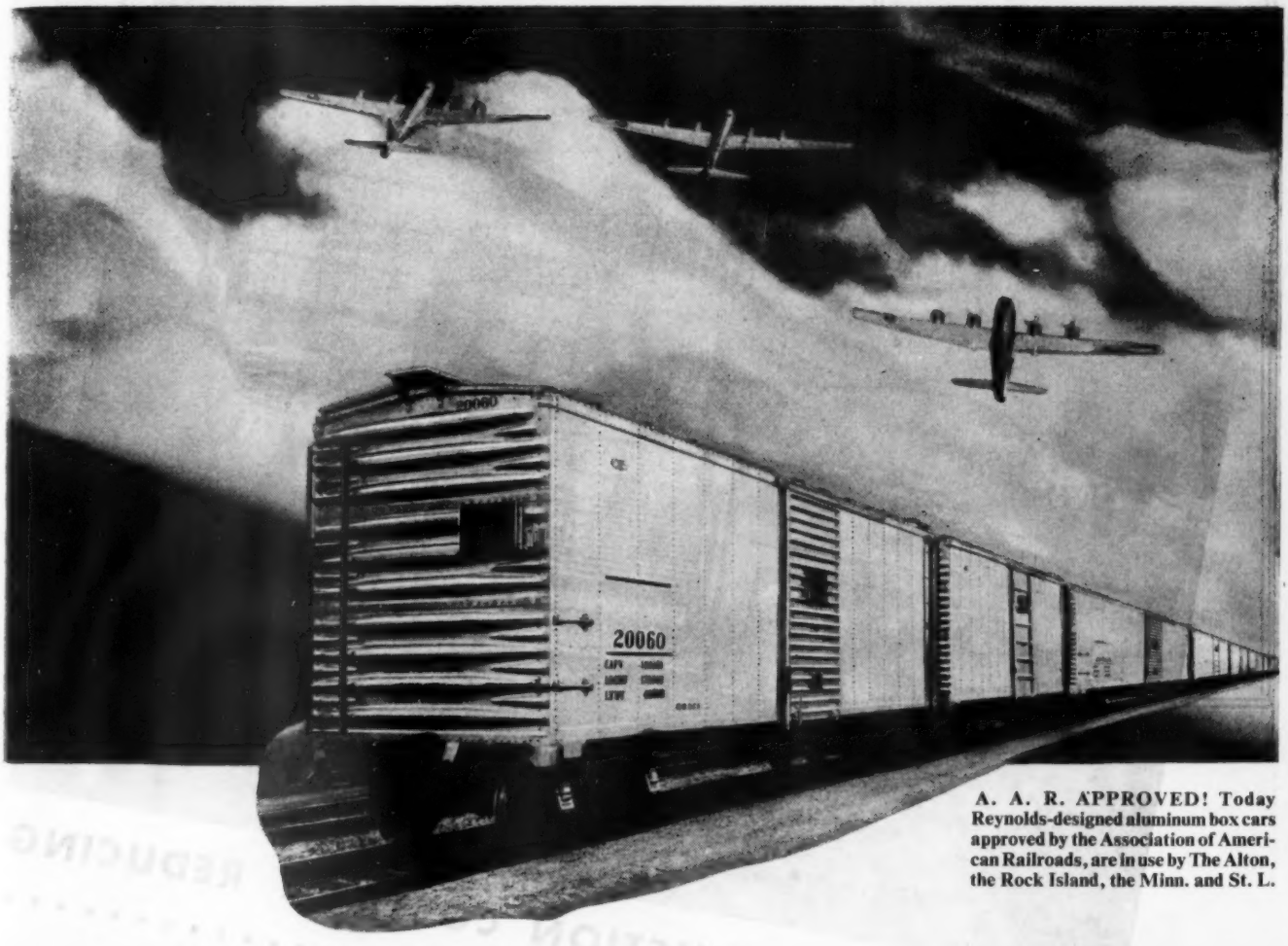
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
The Steel Company of Canada Ltd., Hamilton, Canada
Wolverine Bolt Co., Detroit, Mich.

How UP-TO-DATE are you on ALUMINUM?



A. A. R. APPROVED! Today Reynolds-designed aluminum box cars approved by the Association of American Railroads, are in use by The Alton, the Rock Island, the Minn. and St. L.

Battle-Tested *R301* Makes Box Cars *TOUGHER*

FEW ALUMINUM ALLOYS ever enjoyed the instant, soaring success of R301.

Developed by Reynolds metallurgists . . . announced barely a year ago . . . today, it armor plates the Douglas A-26 . . . cuts hundreds of pounds of dead weight from Superforts . . . and—last, but certainly not least—lends its tough, rugged strength to box cars designed by Reynolds, and first to win the coveted Association of American Railroads approval.

What is R301? Today's airplane armor plate, R301, is tomorrow's great sheet and plate alloy. Combines a typical tensile strength of 60,000 p.s.i.; superior workability; good corrosion-resistance in all tempers, together with excellent spot-welding properties.

Where will it be used? R301 will be used *wherever there's need for light, tough, corrosion-defying sheet and plate.* See catalog in Sweet's or write for Catalog 100-A . . ."Reynolds Aluminum. Its Important Role in Tomorrow's Products." Special Bulletin 50-A, featuring R301, also available. Reynolds engineers will gladly work with your engineers. Offices in principal cities. Phone nearest . . . or write Reynolds Metals Company, Aluminum Div., 2523 South Third Street, Louisville 1, Kentucky. **Consider Aluminum . . . Consult Reynolds.**

Keep your dollars fighting . . . Buy More War Bonds

REYNOLDS METALS

REYNOLDS ALUMINUM

The Great New Source of

INGOT • SHEET • SHAPES • WIRE • ROD • BAR • TUBING • PARTS • FORGINGS • CASTINGS • FOIL • POWDER

CUT YOUR PRODUCTION COSTS BY REDUCING TOOL CRIB INVENTORIES . . . . . .

McCaskey Control Does BOTH

You can't blame tool supervisors and tool crib operators for playing safe when estimating tool requirements. The result, however, nine times out of ten is an inflated inventory of many of the items carried in your tool cribs. And that means tool costs that are unnecessarily high.

McCaskey Tool Control replaces guesswork with facts for determining the quantity of each size of general purpose or special tools you need. Users in plants large and small have reduced their tool crib inventories from 20 to 50% with the data made available by the McCaskey system.

When McCaskey was first installed in one well-known plant, for example, the total inventory was approximately 38,500 tools. After three months (with McCaskey), this inventory was reduced to 15,000 tools.

Another manufacturer reported savings of more than $50,000 in less than one year in one large tool crib serving a plant manufacturing speed reducers, gears, turbine and engine drives, etc.

Similar reports are available from many other plants where McCaskey Control has cut tool investment and effected numerous other savings with direct reductions in tool costs and hence in total production costs.

Let us have a representative explain how McCaskey Tool Control can be installed in the busiest cribs without disturbing your production in the least . . . or send you factual reports of McCaskey savings in several well-known plants.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

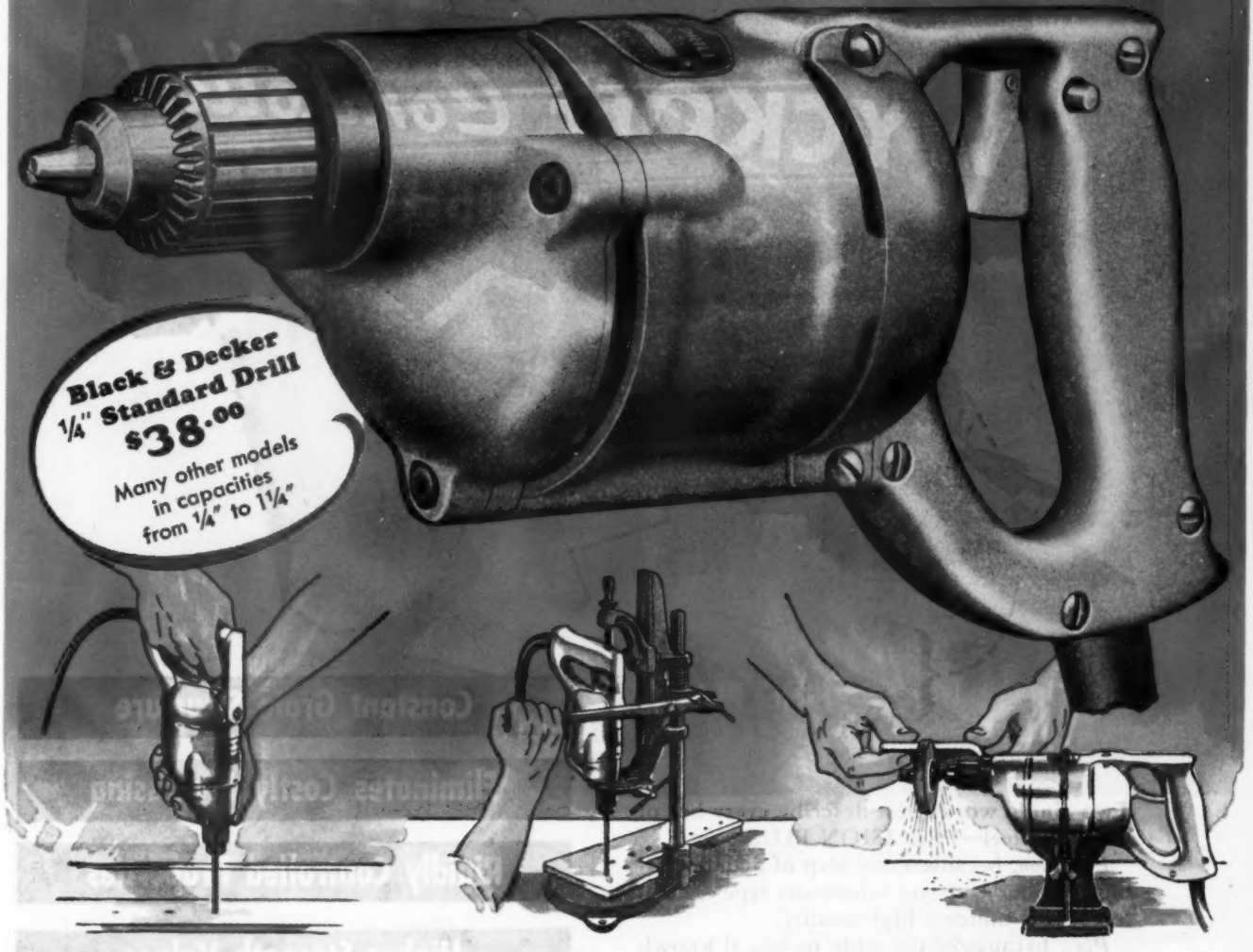
McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

One of the Most Useful of all Electric Tools

-from the world's most complete line



As a Portable Tool . . .

The ¼" Standard Drill drives twist drills up to ¼", wood augers up to ½", hole saws for cutting clean, round holes up to 1½" diameter in any material a hacksaw will cut. Driving countersinks is just one more of the many other uses for this powerful portable tool.

As a Drill Press . . .

Mounted in a Black & Decker Bench Drill Stand ($14.00), the ¼" Standard Drill quickly becomes a powerful drill press, with plenty of leverage to put on the pressure where needed, or for a slow, smooth feed on precision work. Same tool does both bench and portable work.

As a Multi-Use Tool . . .

Mounted in a Black & Decker Horizontal Drill Stand ($2.75), the ¼" Standard Drill does stationary drilling or reaming, and drives wheels for light grinding, wire brushing and buffing. Ball-bearings on all spindles make the ¼" Standard ideal for this latter type of work.

For Complete Catalog of more than 100 different Black & Decker Electric Tools and over 1,000 attachments, write to: The Black & Decker Mfg. Co., 616 Pennsylvania Ave., Towson 4, Md. For help on any tooling problem, see your Black & Decker Distributor.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC **TOOLS**

Two single words best describe every bar of Wyckoff Steel—PRECISION PLUS.

Precision, because every step of manufacturing is under constant laboratory-type control to provide uniform high quality.

Plus, because of the wide technical knowledge and top "steelmaker's" skill found in the entire Wyckoff organization.

Wyckoff engineers will be glad to apply these *Precision-Plus* qualities to your post war production problems.

Constant Grain Structure

Eliminates Costly Processing

Rigidly Controlled Properties

Higher Strength Values

Maximum Machinability—Always

WYCKOFF STEEL COMPANY

First National Bank Building, Pittsburgh 30, Pa.
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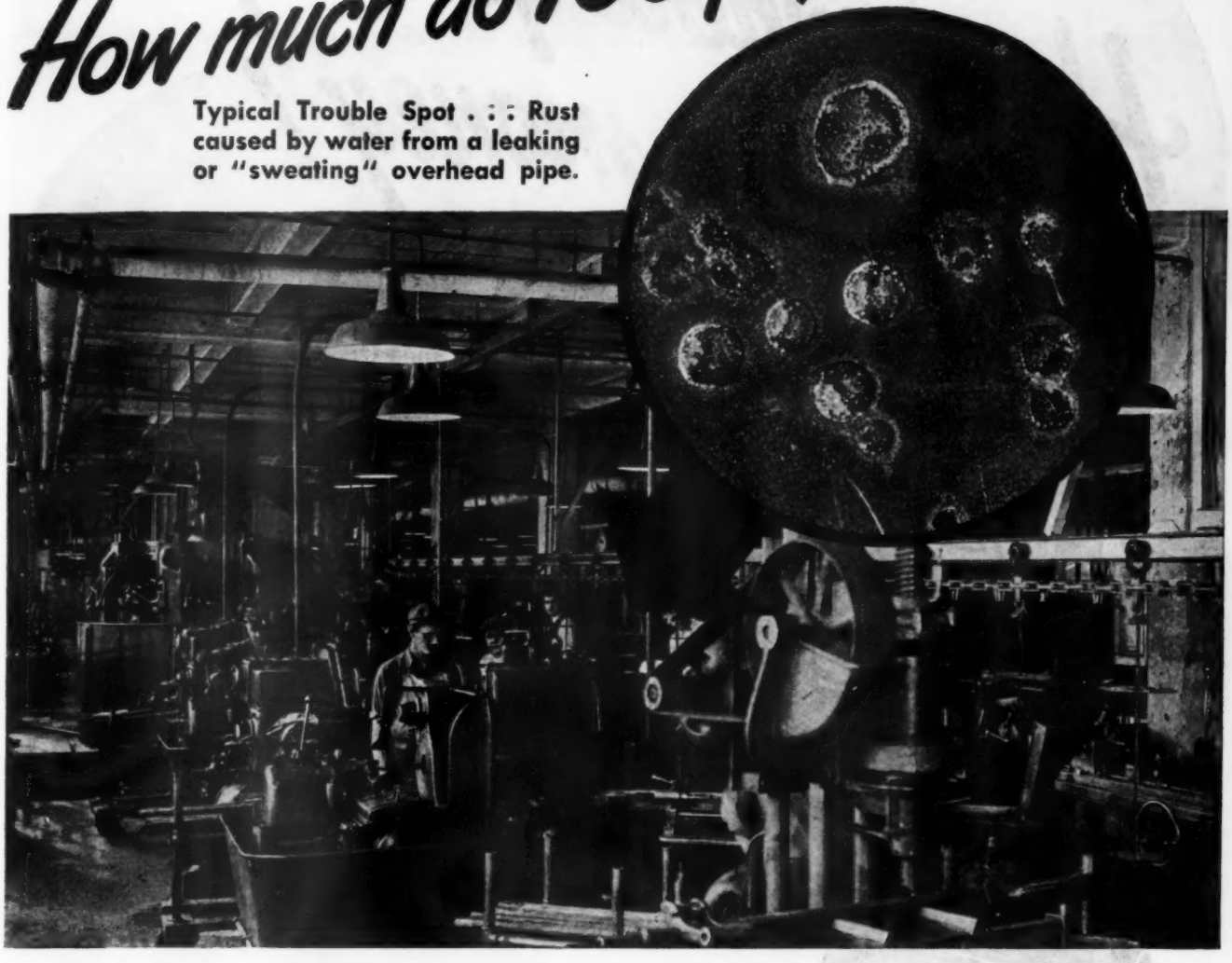
Manufacturers of Carbon and Alloy Steels — Turned and Polished Shafting — Turned and Ground Shafting — Wide Flats up to 12" x 2".

Works at
AMBRIDGE, PA.
CHICAGO, ILL.
NEWARK, N.J.
PUTNAM, CONN.

How much do YOU pay for Rust?

Typical Trouble Spot . . . Rust caused by water from a leaking or "sweating" overhead pipe.



$100,000,000—that's just a conservative estimate of the annual losses caused by rust . . . *how much is your share?*

Precautionary measures can minimize or completely eliminate rust destruction—save you money and production headaches.

Cities Service Rust Remover is an unexcelled first-step in plant-protection. This fast-acting liquid dissolves rust from iron or steel and removes tarnish from aluminum, brass, copper and other non-ferrous metals. It's simple to apply and easy to remove.

After cleaning, your Cities Service engineer will show you how to protect and preserve the cleaned metal surfaces with a special coating of one of our exclusive Anti-Corrodes.

Cities Service will be glad to study your plant operations and recommend a suitable rust-prevention program without obligation on your part.

You may avoid considerable trouble and expense. Consult a Cities Service expert today.

CITIES SERVICE OILS
ONCE-ALWAYS

MAIL THIS COUPON TODAY!

Cities Service Oil Company
Room 369, 70 Pine Street, New York 5, N. Y.
Gentlemen: I am interested in your Rust Prevention Program. Please contact me.

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Title.....

Company.....

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Here's where you begin to save money!

—ON THE DRAWING BOARD!

Consider the better performance and the economies of Morse Silent and Roller Chain Drives. Positive, no-slip operation ...TEETH NOT TENSION...eliminates power waste, assures smooth, trouble-free operation. When your power transmission problem is on the drawing board, call the Morse engineer . . . that's where savings can start!

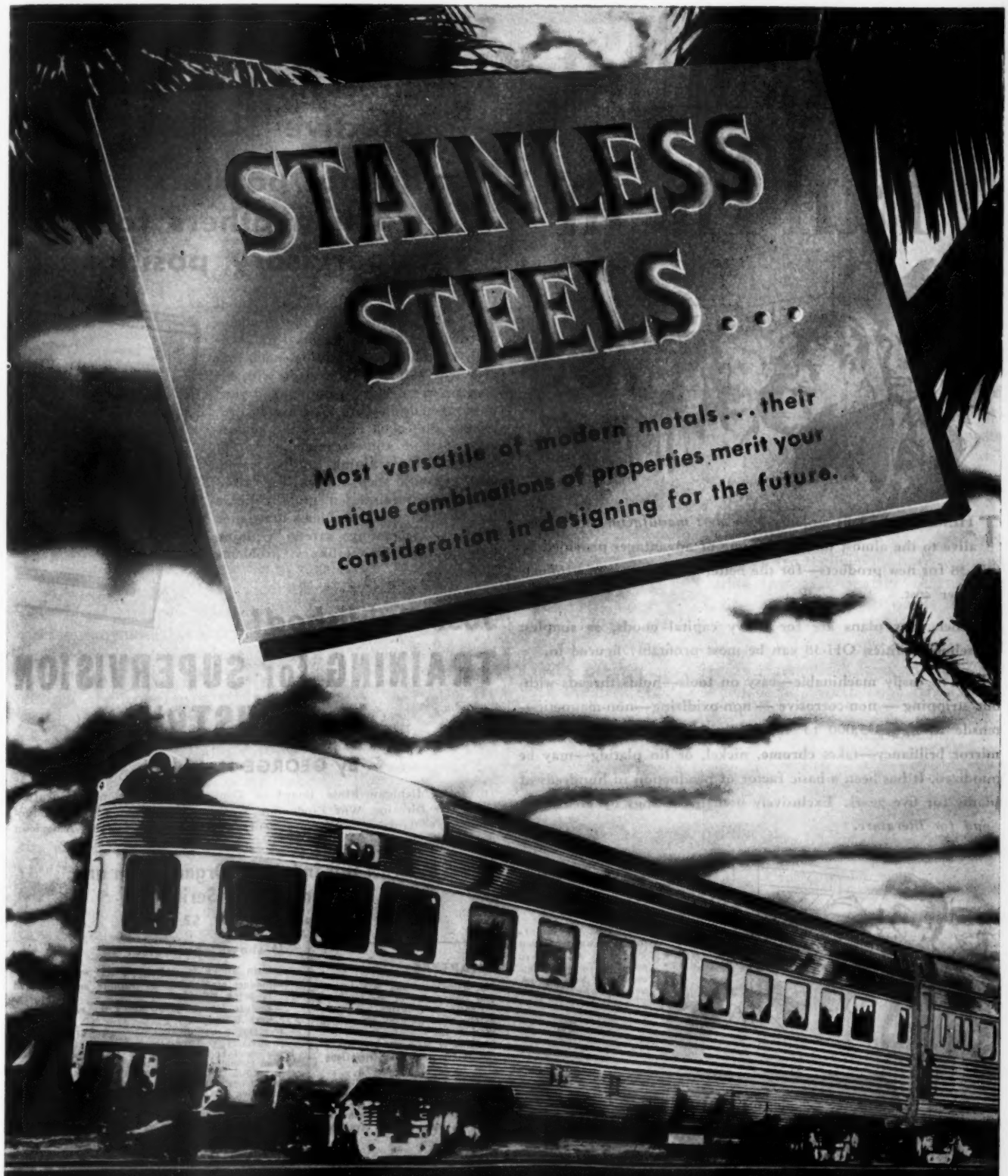
Teeth Not Tension

ARMY E NAVY

SPROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE Roller and Silent CHAINS

MORSE CHAIN COMPANY • ITHACA, N.Y. • DETROIT 8, MICH. • A BORG-WARNER INDUSTRY


STAINLESS STEELS...
Most versatile of modern metals... their unique combinations of properties merit your consideration in designing for the future.

● This Streamliner exemplifies the enduring strength and beauty of stainless steel. Characterized by endurance under corrosive conditions, chromium-Nickel stainless steels permit reduction of bulk and dead weight...without sacrifice of strength or safety.

• • •

International Nickel are miners, smelters and refiners of Nickel, an important ingredient of the stainless steels, but do not produce stainless steels. If interested, please communicate with established sources of supply for stainless steels.

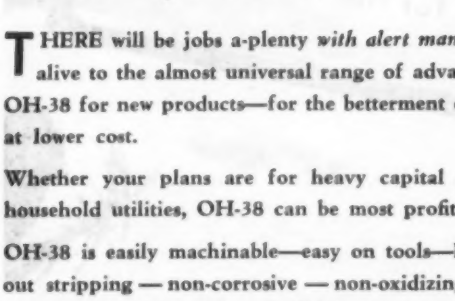
THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.

We Shall Not Fail Them

THERE will be jobs a-plenty *with alert manufacturers* who are alive to the almost universal range of advantages provided by OH-38 for new products—for the betterment of present products at lower cost.

Whether your plans are for heavy capital goods, or simplest household utilities, OH-38 can be most profitably figured in.

OH-38 is easily machinable—easy on tools—holds threads without stripping — non-corrosive — non-oxidizing—non-magnetic—tensile strength 35,000 to 40,000 lbs. per sq. in.—polishes to mirror brilliancy—takes chrome, nickel, or tin plating—may be anodized. It has been a basic factor of production in hundreds of plants for five years. Exclusively used in castings by Hedstrom. *Send for literature.*



OH-38 is an important reason why you will be needed in peace as in war. New models. New products. Jobs!

Many component parts of post-war products can be made better, faster, cheaper—with

OH 38

Aluminum Alloy, Non-Heat-Treated—a perfected metal with proven superiority in a wide range of machining operations—an exclusive product of

Oscar W. Hedstrom Corporation

4812 W. Division St., Chicago 51, Illinois

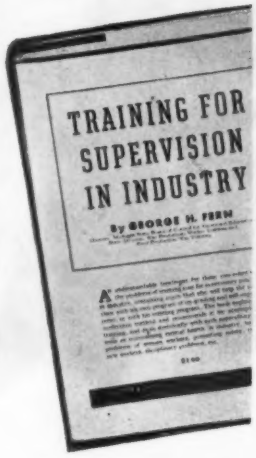
Manufacturers of Aluminum, Brass, Bronze, and High Conductivity Copper Castings. Pattern Makers. Complete Mechanical Assemblies and Models to Specifications.

Showing you—

—direct methods for more effective SUPERVISION

—helpful pointers on training others for supervisory positions

Here is a direct and practical manual for those concerned with the problems of training men for supervisory positions in industry, containing much that also will help the supervisor with his own program of up-grading and self-improvement, or with his training program. The book explains the conference method and recommends it for accomplishing training, and deals specifically with such supervisory problems as maintaining mental health in industry, handling problems of women workers, promoting safety, training new workers, disciplinary problems, etc.



Just Published!

TRAINING for SUPERVISION in INDUSTRY

By GEORGE H. FERN

Director, Michigan State Board of Control for Vocational Education and State Director, War Production Worker Training and Food Production War Training; Vice-president, Industrial Education, American Vocational Association, Inc.

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- The Supervisor and His Job
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- Women in Industry
- Starting a New Worker Right
- Supervisors and Job Relations
- How to Analyze Jobs
- How to Lead a Conference
- Training Conference Discussion Topics and Analyses
- The Supervisor as an Instructor
- Training Opportunities Available Today

It shows how better to:

—train others to do supervisory work

—conduct conferences, as training programs, and to bring out ideas

—analyze jobs to bring about the most efficient work output

Use this guide to upgrade yourself in your own supervisory position—to train the kind of men you need and want on the job. The presentation throughout is by means of the conference technique. This manual instructs the supervisor in efficiently executing his own job, includes an intensive analysis of how to teach others and provides complete instructions for leading the business conference.

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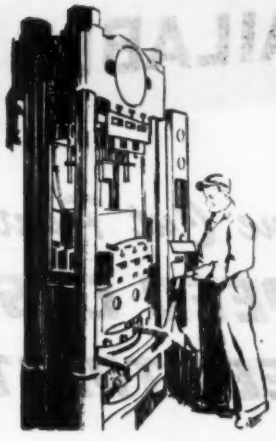
MACHINING DATA ON PLASTICS

8. ENGRAVING

(PART ONE OF THREE PARTS)



This is the eighth in a series of messages designed to better your knowledge of the phenolics—the most versatile of all plastics . . . the type of plastics which Durez has specialized in producing during the past quarter century.

The most practical method of engraving numerals, monograms, lettering and such is by direct molding operation. For example, if recessed lettering is desired in the molded product, the lettering is raised in the mold cavity and if, on the other hand, raised lettering is desired, the lettering is stamped into the mold cavity.

Engraving The Mold Cavity

For best results in producing raised lettering on the mold cavity (this, of course, produces recessed lettering in the molded plastic part), most experienced molders use the hobbing process. This is very economical from the standpoint of mold construction and proves highly satisfactory for producing an even, smooth background.

For the most satisfactory results in producing recessed lettering in the mold cavity (this results in raised lettering on the molded plastic part), it is recommended that the lettering be machine engraved in the cavity. However, there is also another method whereby the lettering is stamped into the cavity with a master stamp by means of hydraulic pressure or a power press. In doing this, the lettering should be stamped approximately .003" deeper than would seem normal, machining (by turning) or grinding off the excess of the mold to provide a smooth background on the molded part.

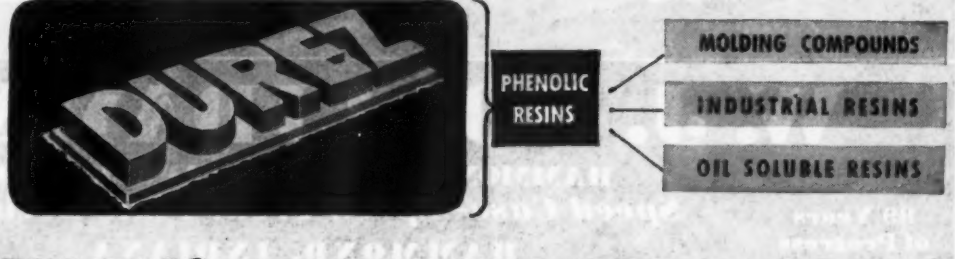
Limitations

Although the molding method will produce millions of lettered parts during the life of the mold, one should remember that it is impossible to deviate from the original engraving other than filling the lettering with different colors. In cases where deviation is desired, other methods such as branding, stamping, or machine-engraving would probably prove more practical. These will be discussed in future ads.

Expert Assistance Available

The benefits of the vast experience which Durez technicians have acquired during the past quarter century are available at all times towards furthering your progress in the machining and finishing of phenolic plastics. Durez Plastics & Chemicals, Inc., 538 Walck Road, North Tonawanda, N. Y.

This bottle closure is a typical example of engraving by direct molding operation.



PLASTICS THAT FIT THE JOB

AVAILABLE FROM 12 SOURCES

Flame Cut Parts of SPEED CASE *and* SPEED TREAT *Plate*

Nationwide stocks of fast machining *Speed Case* (X1520) and *Speed Treat* (X1545) plates, plus up-to-date, well-equipped flame cutting departments, make possible the saving of time and lowering of costs on single pieces or production quantities cut from these modern steels.

Facilities for stress relieving after cutting are available when needed.

Call the nearest distributor listed below for plates in standard sizes or pieces flame cut to shape in *Speed Case*, the low carbon, open hearth, free machining steel; or *Speed Treat*, the medium carbon, open hearth, free machining steel.

The Burger Iron Co.
Akron 1, Ohio

Brown-Wales Co.
493 C St.
Boston 10, Mass.

Beals, McCarthy & Rogers, Inc.
Buffalo 5, N. Y.

Peninsular Steel Co.
1030-40 McDougall Ave.
Detroit 7, Mich.

W. J. Holliday & Company
Hammond, Indiana

Earle M. Jorgensen Co.
5311 Clinton Drive
Houston 1, Texas

W. J. Holliday & Company
Indianapolis, Ind.

Earle M. Jorgensen Co.
10510 So. Alameda St.
Los Angeles 54, Calif.

Grammer, Dempsey & Hudson, Inc.
Newark 5, N. J.

Earle M. Jorgensen Co.
1657 22nd St.
Oakland 7, Calif.

Horace T. Potts Co.
East Erie Ave. and "D" St.
Philadelphia 34, Pa.

Peckover's Limited
77 Front St. E.
Toronto 2, Ont., Canada

Gas cutting installation, typical of the flame cutting departments of *Speed Case* and *Speed Treat* plate distributors.

Note:—Multiple cuts, as above, can be held to close tolerances, thus eliminating excessive machining.

W. J. HOLLIDAY & CO.

HAMMOND AND INDIANAPOLIS, IND.

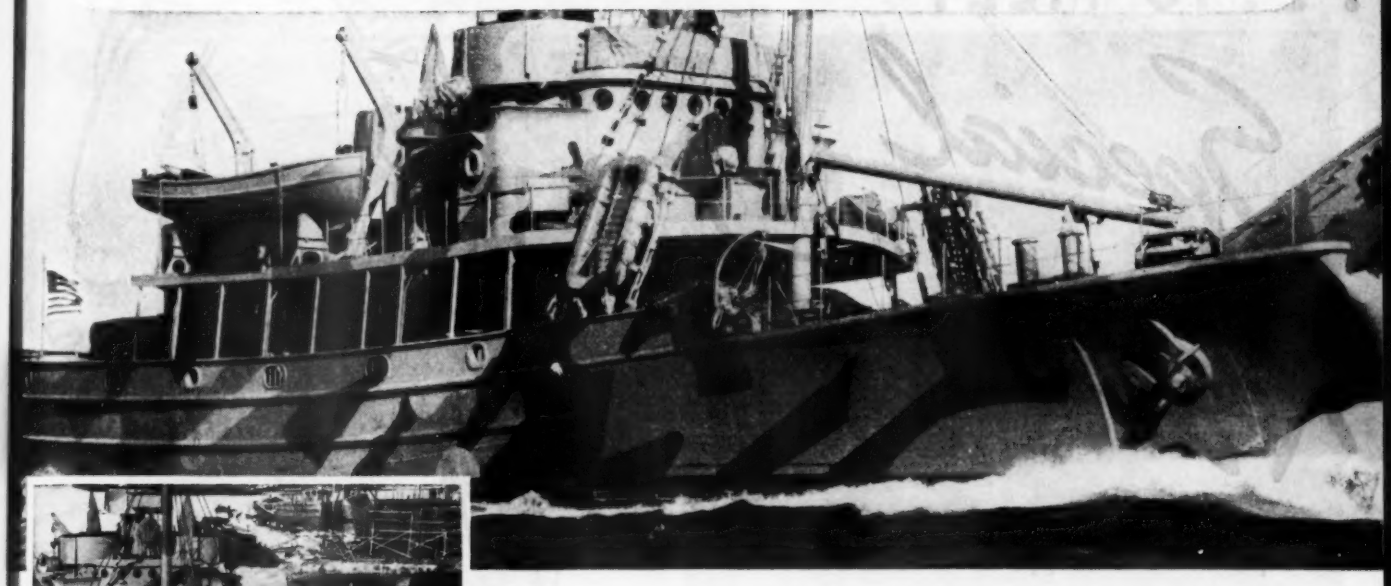
***Speed Case—Speed Treat* Plate Division**

HAMMOND, INDIANA

89 Years of Progress

Established 1856

"WAREHOUSE STEEL" built this Net Tender!



Practically every pound of STEEL for this ship was supplied from our Warehouse Stocks.

A SHIPYARD in Sturgeon Bay, Wisconsin, called us in and showed us a list of steel that was needed in a hurry to build the Navy net tender shown above. We checked the inventories of all our warehouses and found that we could supply almost the entire order *from our warehouse stocks* . . . dramatic evidence of the wide variety of steel available in our warehouses for quick shipment. The hundreds of steel items needed for this job were all delivered on time, enabling the shipbuilder to maintain his production schedule.

When you need steel—whether a pound or a carload—get in touch with our nearest warehouse. Our stocks include all standard grades and sizes of U·S·S Stainless Steel and a complete line of Carbon Steel Products. Our service may help you solve a production problem—avoid serious delay on important war work. Your orders and inquiries will receive courteous attention and quick action.

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BALTIMORE (3),	Bush & Wicomico Sts., P. O. Box 2036	GILmore 3100
BOSTON	176 Lincoln St., Allston (34), P. O. Box 42	STAdium 9400
CLEVELAND (14),	1394 East 39th St.	HEnderson 5750
MILWAUKEE (1),	4027 West Scott St., P. O. Box 2045	Mitchell 7500
NEWARK (1), N. J.	Foot of Bessemer St., P. O. Box 479	Bigelow 3-5920
		REctor 2-6560 · BErgen 3-1614
PITTSBURGH (12),	1281 Reedsdale St., N. S.	CEdar 7780
ST. LOUIS (3),	21st & Gratiot Sts., P. O. Box 27	MAin 5235
TWIN CITY,	2545 University Ave., St. Paul (4) Minn.	NEstor 2821

UNITED STATES STEEL SUPPLY COMPANY USS STEELS SERVICE

UNITED STATES STEEL

. . . TO MEET *Special Requirements*

Every power driven appliance, machine and device is designed to perform a certain specific or special function. Many function well with standard type motors. Others need special powering to meet special requirements.

For those special requirements WELCO Torque Motors are the answer. They are custom-built not only to provide peak performance, but to conform to and properly fit the machines they must power. That is why for thirty-five years industry has been making a beaten path to The B. A. Wesche Electric Company — specialist in special motors. WELCO Torque Motors are built up to 75 H.P.

Write Today For Complete Details

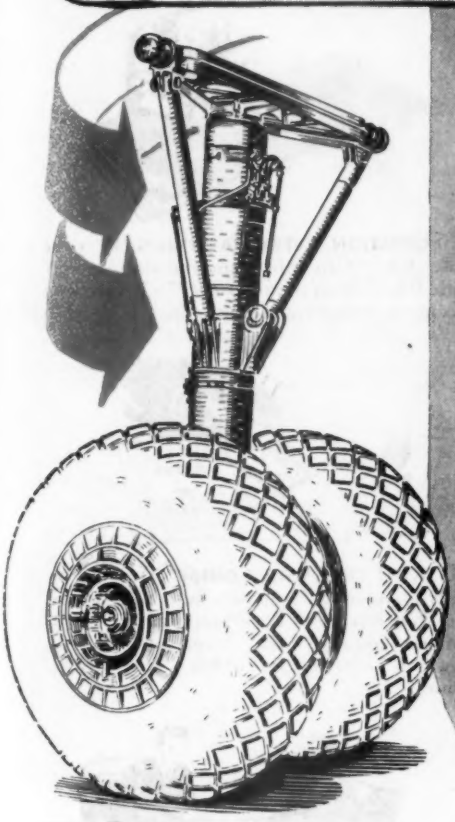
EXCLUSIVE FEATURE

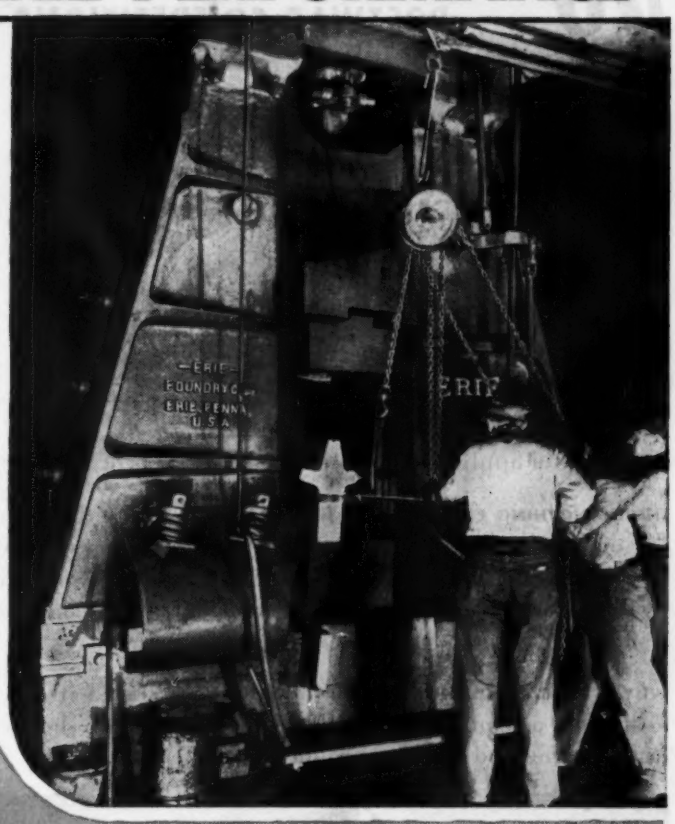
The "Uni-frame" construction of WELCO Torque Motors provides for an easy interchange of A.C. and D.C. motors to fit the same housing or frame. Only WELCO has this vitally important feature.

THE B. A. WESCHE ELECTRIC CO.

1624-4 VINE STREET **CINCINNATI 10, OHIO**

AIRCRAFT FORGINGS UNDERWRITE *B29* DEPENDABLE PERFORMANCE





Here is a perfect example of the high impact velocity of the Erie Steam Drop Hammer and quick lift after the blow due to the Erie valve gearing design. These features are vital to the success of this job with its deep straight impression in bottom die.

● You are welcome to Erie bulletins giving full details on Erie Hammers . . . Steam Board Drop . . . Single and Double Frame Forging Hammers.

THE directioning of the fibre structure of metals by forging improves their quality at points of greatest stress and impact in service . . . assures dependable performance . . . But there is an added factor which is often overlooked . . . the "feeling of safety" which the user of a machine experiences when you tell him "this part and that part is a forging" . . . This added confidence which only forgings implant in the user's mind is particularly noticeable among aircraft pilots and crews . . . The war plane combat crews will tell you how the word "forgings" registers "a bulwark of safety" in their thinking. Forgings, the product of thousands of Erie Steam and Board Drop Hammers, will give finished machines of the peacetime world that same acceptance by their operators underwriting human confidence and dependable performance.

ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA

ARMY E NAVY

ERIE

ERIE BUILDS *Dependable* HAMMERS

WOULD A

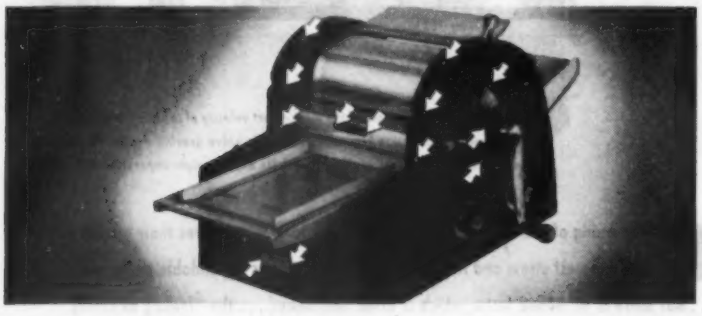
50% Assembly Saving

HELP YOUR PRODUCT BEAT POSTWAR COMPETITION?

CUTTING ASSEMBLY COSTS IN HALF is nothing unusual for P-K Self-tapping Screws *the short cut fastening method!* Records of thousands of applications show frequent savings of 30 to 50%.

THERE'S NOTHING EXCEPTIONAL about such savings, either. In 7 out of every 10 jobs submitted for fastening survey, it was found that P-K Screws could eliminate tapping – speed assembly – lower costs – reduce spoilage – improve strength and rigidity.

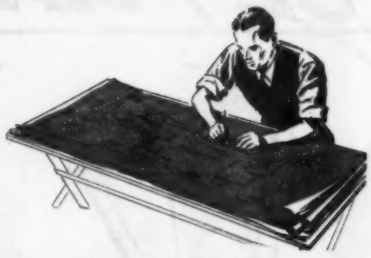
WHY HANDICAP YOUR PRODUCT in the postwar market with needlessly high assembly costs? Change over now to the short cut fastening method – *before* production starts!



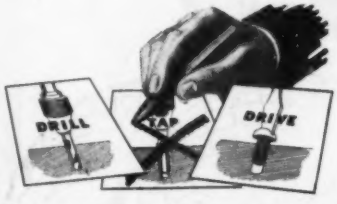
FASTENINGS TO HEAVY AND LIGHT STEEL, ZINC, ALUMINUM . . . WITH SAVINGS UP TO 40%

of time and labor . . . stronger assemblies . . . faster production. That is what Ditto, Inc., gained by using P-K Type "Z" and Type "U" Self-tapping screws for 52 fastenings on this duplicating machine. Now, their policy is "to use this short cut method wherever possible" . . . good advice for you!

HERE'S HOW TO START ASSEMBLY SAVINGS WHEN YOU START PRODUCTION



1. **QUESTION EVERY FASTENING** in your plans. Ask – "Can it be done the simpler way – with P-K Self-tapping Screws?" – before you O.K. more complicated methods.

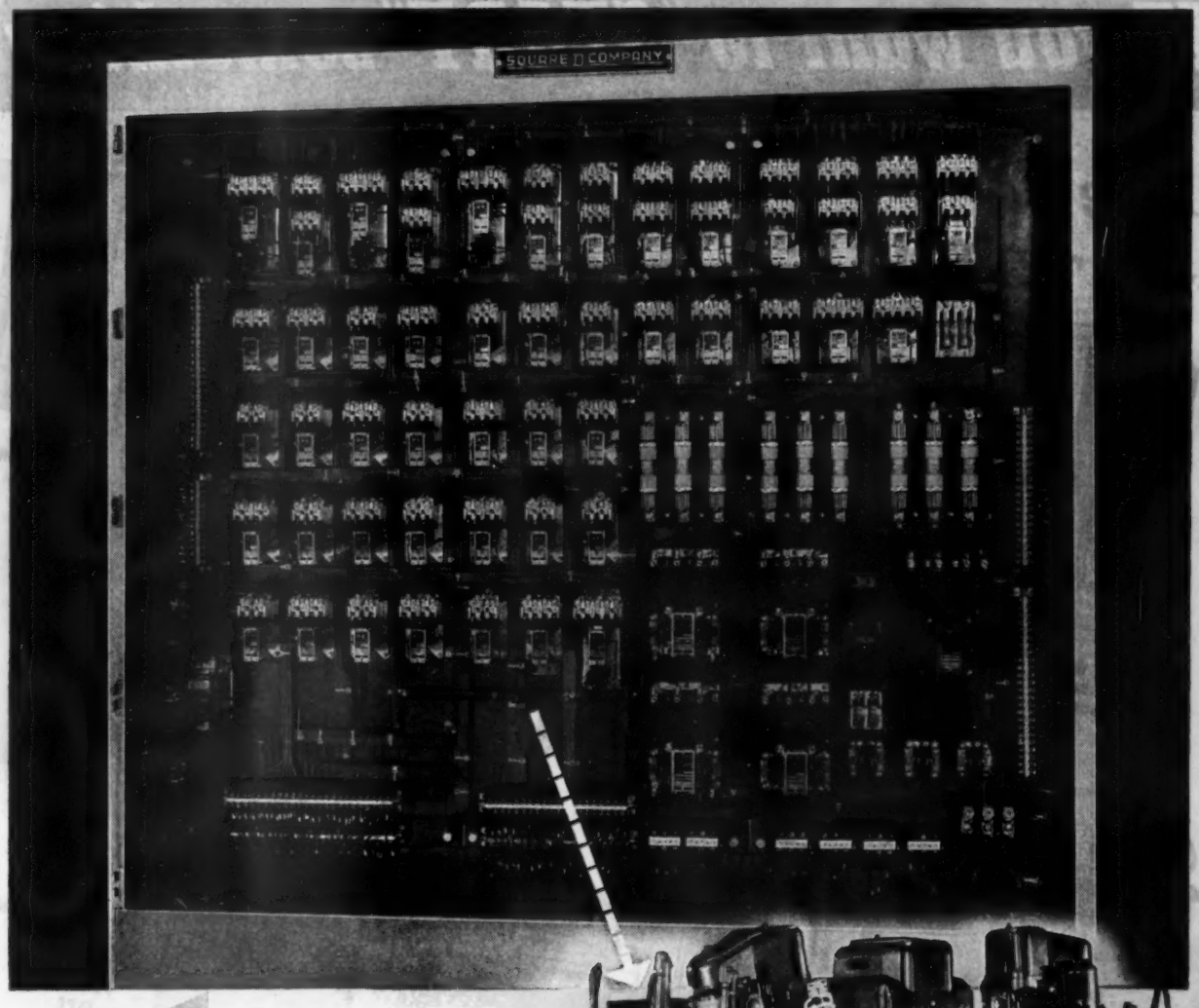


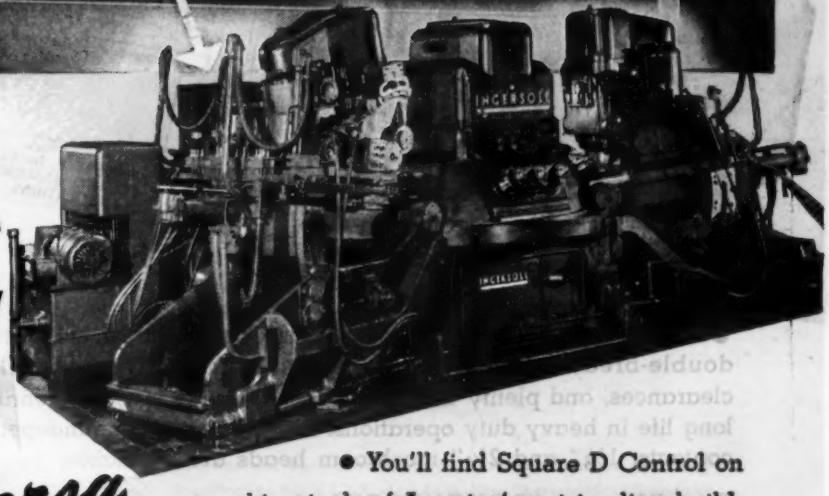
2. **WITH THE "USERS' GUIDE"** (free to assembly planners on request), find out how and where you can use P-K Self-tapping Screws to eliminate tapping, costly inserts in plastics, awkward bolting and other "slowdown" methods.

3. **ASK A P-K ASSEMBLY ENGINEER** to go over your plans with you – to make sure you don't miss any chance to save. You'll find his advice unbiased, because Parker-Kalon makes all types of Self-tapping Screws. Or, send assembly details for recommendations. Parker-Kalon Corporation, 208 Varick St., New York 14, New York.

PARKER-KALON
Quality-Controlled
SELF-TAPPING SCREWS

For Every Metal and Plastic Assembly





Judge MOTOR CONTROL by the company it keeps...

...and Vice-Versa

● You'll find Square D Control on machine tools of America's outstanding builders. They value the counsel of Square D Field Engineers and the sound engineering built into an unusually complete line of control units and accessories.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

IF you want to "START" something

—use "3C" TYPE D PUSH BUTTON STATIONS

3 UNIT WITH HOLD-DOWN LOCK
4 UNIT WITH PILOT LIGHTS
10 UNIT WITH PILOT LIGHT, SELECTOR SWITCH, MUSHROOM HEAD
6 UNIT, SMALL MUSHROOM HEAD
5 UNIT WITH SELECTOR SWITCH
2 UNIT STATION
1 STATION MUSHROOM HEAD
PENDANT TYPE
TYPE RN
WATER TIGHT, NEMA ICS0-42
DUST TIGHT, NEMA ICS0-23
OIL IMMERSED, for CLASS 1, GROUP D, HAZARDOUS LOCATIONS
START
STOP

● Clark Type D Push Buttons, featuring silver-to-silver, button-type, double-break contacts, bakelite insulating parts, large electrical clearances, and plenty of wiring space, provide low maintenance and long life in heavy duty operations. Push button stop is independent of contacts. 1½" and 2¼" mushroom heads are available.

Type RN — the "ROUGHNECK" — has mushroom head, cast metal enclosure with rounded shoulders sturdy enough to take rough usage.

Watertight, dust tight, and oil-immersed types can be supplied. Pendant Stations are also available.

For every heavy duty industrial push button application there's a "3C" Push Button Station available.

THE CLARK CONTROLLER CO.

1146 EAST 152nd ST., CLEVELAND 10, OHIO • OFFICES IN PRINCIPAL CITIES

LOOK OUT BELOW

You rarely need bother about the nut loosening on your bolted assemblies. It's the other parts that loosen as their contacting surfaces inevitably wear down.

A nut cannot budge while there is the slightest pressure between its threads and the threads of its bolt. But look out below the nut—where looseness develops from bolt stretch, and the frictional wear of metal on metal, burrs, flares, and the pulverizing of paint, scale or rust.

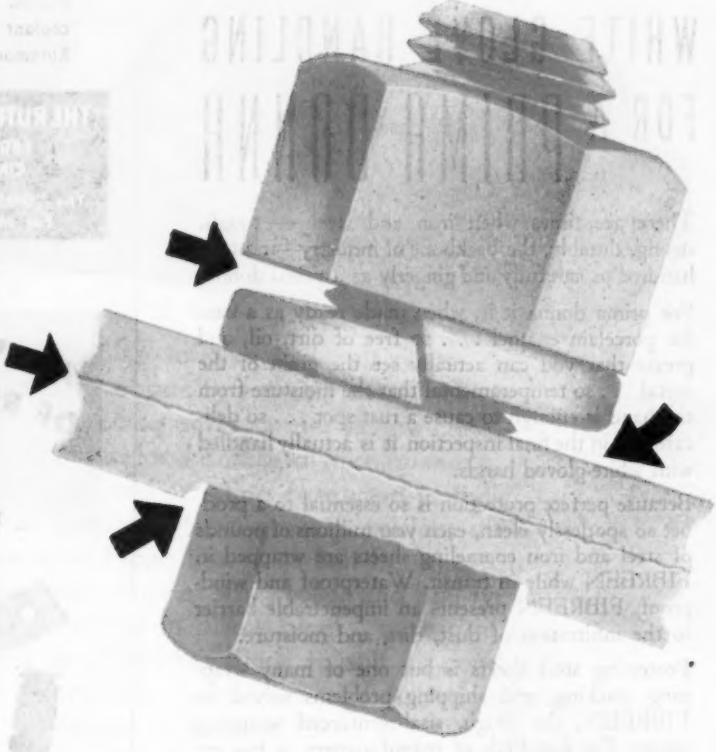
You can retard this inevitable wear only by using a powerful spring washer which expands as the wear occurs.

Kantlinks expand over a wide range, and thus hold all parts tight. No device other than a spring can do this job.

Whether you use a standard nut or any one of the many fixed or lock-nuts you need a strong spring washer.

If you want real bolted security, specify Kantlinks.

Send today for descriptive folders.



Our Kantlink Spring Washers conform to Ordnance Standard Specification BECX 1-2-3-, and Army-Navy Aeronautical Standard AN 935, and U. S. Navy drawing 12-Z-22.

Originators of KANTLINK the long-range spring washer

NATIONAL LOCK WASHER COMPANY

NEWARK 5, NEW JERSEY **MILWAUKEE 2, WISCONSIN**

WHITE GLOVE HANDLING FOR A PRIMA DONNA

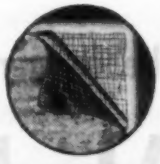
There are times when iron and steel — tough, strong, durable, the backbone of industry—must be handled as carefully and gingerly as a prima donna.

For prima donna it is, when made ready as a base for porcelain enamel . . . so free of dirt, oil, and grease that you can actually see the grain of the metal . . . so temperamental that the moisture from the hand is enough to cause a rust spot . . . so delicate that in the final inspection it is actually handled with white-gloved hands.

Because perfect protection is so essential to a product so spotlessly clean, each year millions of pounds of steel and iron enameling sheets are wrapped in FIBREEN while in transit. Waterproof and windproof, FIBREEN presents an impenetrable barrier to the infiltration of dust, dirt, and moisture.

Protecting steel sheets is but one of many wrapping, packing, and shipping problems solved by FIBREEN, the tough, sisal-reenforced wrapping paper. For hundreds of manufacturers, it has cut time . . . saved labor . . . reduced costly crating, shipping, and handling charges. It may be the answer to some of your own shipping problems. *Why not investigate its possibilities.*

Sisal fibre reenforcement for strength—special asphalt for water-proofness—kraft paper for clean, easy handling—sealed by heat and pressure to produce Fibreen.



THE SISALKRAFT CO.
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NEW YORK · SAN FRANCISCO · LONDON · SYDNEY

Manufacturers of
SISALKRAFT, FIBREEN, SISAL-X, SISALTAPE AND COPPER-ARMORED SISALKRAFT

Do you want to —
- SPEED PRODUCTION
- ELIMINATE COOLANT PROBLEMS
- SAVE MONEY?

You can do all 3 with
RUTHMAN GUSHER COOLANT PUMPS

Reports from machine tool operators testify to the long life, low maintenance cost, and dependable service of Ruthman Gusher Pumps. To speed production, eliminate coolant problems, and save money, specify Ruthman Gusher Coolant Pumps.

MODEL 11020-A

THE RUTHMAN MACHINERY CO.
1809 READING ROAD
CINCINNATI 2, OHIO
The "GUSHER"—A Modern Pump For Modern Machine Tools

A FEW OF THE THOUSANDS OF REASONS . . .

WHY *Felt* CAN HELP YOU!

Thousands of shapes and sizes . . . a wide range of characteristics and qualities . . . these are reasons why Western Felt is so widely used. Processed from wool softness to rock hardness, Western Felt resists water, heat, age and oil . . . deadens sound . . . insulates against heat and cold. It is resilient, flexible, and compressible.

Let Western Felt Works engineers help you decide how felt can help you produce a better product at lower cost. Write us today.

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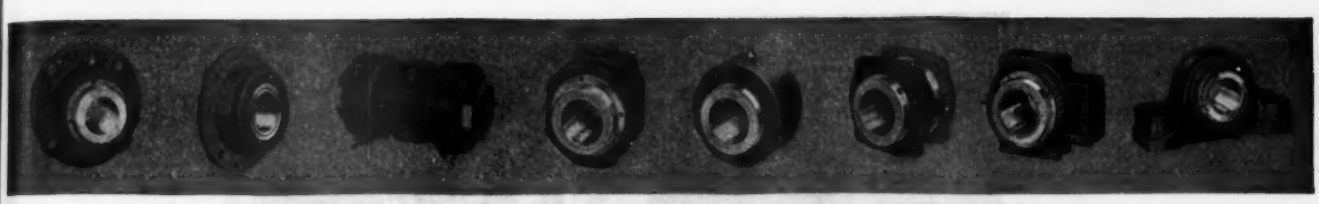
Largest Independent Manufacturers and Cutters of Wool, Hair and Jute Felts



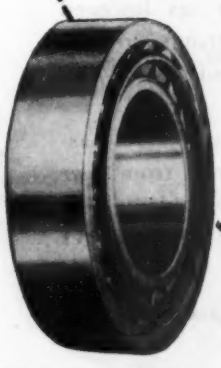
UNIQUE DESIGN *Plus* PRECISION MANUFACTURE

● Two basic elements combine to give Link-Belt roller bearings their outstanding capacity for service. Their design provides for free rolling action under severe conditions of radial load, thrust load and axial misalignment. The advanced methods and exacting care used in their manufacture bear results in their great precision, efficient performance and long life. Link-Belt bearings are obtainable in a wide range of sizes, roller and ball types, unmounted or mounted in pillow blocks, cartridge and flanged units, or other mountings to suit all conditions of service. Complete description and full engineering data are contained in Book 1775-A.

Link-Belt also makes a complete line of babbitted bearings, chains, sprockets, couplings, hangers, pulleys, speed reducers, variable speed changers, and all types of materials handling machinery.

LINK-BELT COMPANY Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Warehouses and Distributors in principal cities.

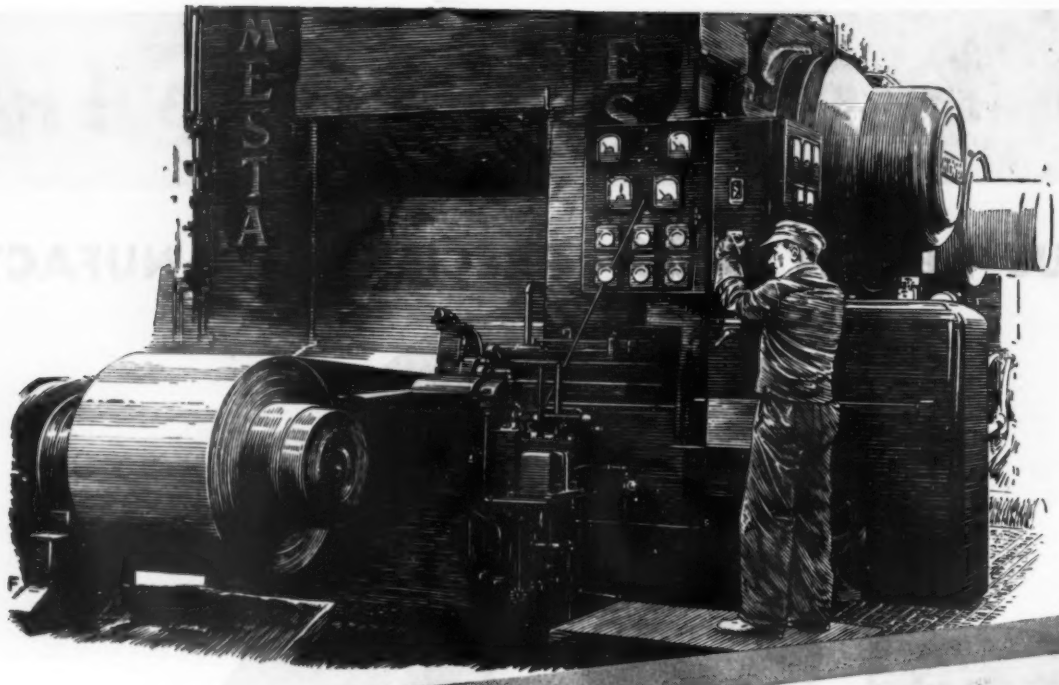
9852



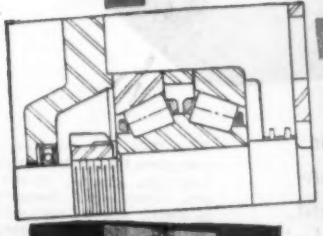
Link-Belt Series "DE" roller bearings, illustrated, are self-contained and are properly adjusted at the factory, requiring no further adjustment at installation. Their inherent self-aligning and pre-adjustment features make it unnecessary to resort to the use of undesirable, expensive, or cumbersome self-aligning housings. The "self-contained" feature also permits the bearing to be floated axially in the housing to compensate for shaft expansion.

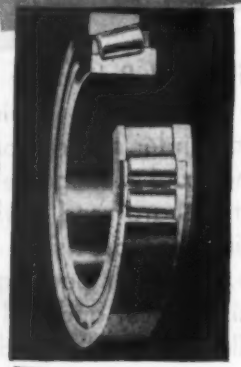
LINK-BELT

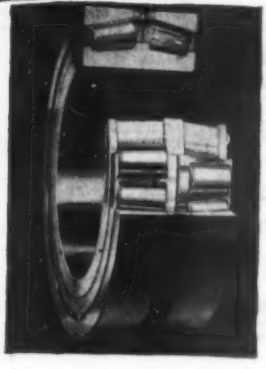
BALL AND ROLLER BEARINGS

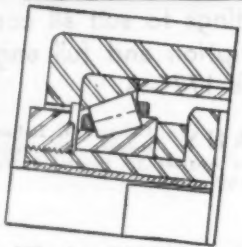


FOR FASTER COLD MILL REELS
...AND OTHER HEAVY-DUTY EQUIPMENT









Mesta reel shown with Five Stand Tandem Cold Mill turns on one double-row and two single-row steep angle Torrington Tapered Roller Bearings. Capacity of bearings in pounds at 100 RPM: double-row, radial, 202,100; thrust, 155,200; single-row, radial, 114,500; thrust, 185,000. This is one of many steel mill and other heavy-duty applications where sturdy, efficient Torrington Bearings help speed production.

The reel of the cold mill you see above is one of the world's fastest. It "coils" 3,200 feet of strip per minute . . . and at required tension for final quality control. That means extreme radial and thrust loads on the reel. . . loads handled efficiently by one double-row and two single-row, steep angle Torrington Tapered Roller Bearings.

On steel and paper mill machinery . . . on oil field and hoisting equipment . . . on machine tools and other heavy-duty applications . . . bearings designed and built by Torrington's Bantam Bearings Division provide efficient, economical, trouble-free *anti-friction operation.*

In the competitive markets ahead, you should assure yourself that kind of performance from *your* heavy-duty machinery. Our engineers will gladly help yours to incorporate Torrington Bearing advantages in your designs.

THE TORRINGTON COMPANY · BANTAM BEARINGS DIVISION
SOUTH BEND 21, INDIANA

TORRINGTON BEARINGS

STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL

In Your
PRODUCTION PLANNING
Include
Rubber-Cushioned
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for
BURRING • CLEANING
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Time-saving methods and production procedure achieved in war industries by Brightboy's *rubber-plus-abrasive finishing action,* are being adapted in the production planning for many existing or proposed products.

Ask your distributor to tell you about Brightboy's wide adaptability. Get catalogs, prices and work data. *Before* you OK your production procedure, check with a Brightboy service man who will show you production short-cuts; product-finishing improvements.

A Complete Line in 3 Textures
for All Manual and Machine Operations

LOOK TO BRIGHTBOY FOR
A REVELATION IN METAL FINISHING!

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO. Newark 7, N. J.

BRIGHTBOY TUFF-TEX
Tougher texture, for finishing hard metals. The tougher binder accents the abrasive action, yet retains the soft rubber cushion, finishing and pre-polishing in one operation.

BRIGHTBOY STANDARD
A favorite for burring, finishing and polishing on the widest variety of metals and metal parts.

BRIGHTBOY FINE-TEX
Smoother, finer texture for work on softer metals, producing special finishes and for applications where the coarser wheel might not be suitable.

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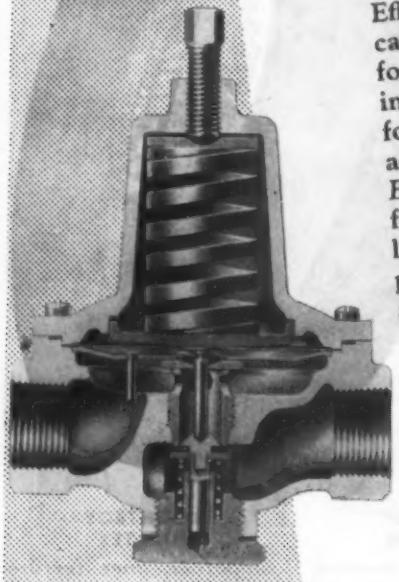
BALANCED PERFORMANCE

NORGREN REGULATORS

in the air line guarantee "balanced performance" of air tools and cylinders under any working condition.

Efficient, compact unit automatically reduces line pressure to uniform working pressure. No surge in pressure to throw tool performance out of rhythm. Quickly adjustable over a wide range. *Bronze-synthetic diaphragm* for flexibility, quick action and long life. *Floating action* of diaphragm greatly reduces rupturing and shearing. *Syphon tube* assures greater volume of air or fluid to pass with less pressure drop than conventional regulators. Available for air, gas, steam, oil and hot or cold water.



Write for catalog 400. C. A. Norgren Co., 220 Santa Fe Drive, Denver 9, Colorado

Norgren

PRECISION PARTS

SMALL PARTS WITH A BIG FUTURE

Smooth working communications, straight shooting that hits the target, bombing that wipes out an objective—all these and many other operations vital to victory are dependent upon small, highly accurate instrument parts.

Maintaining such exacting tolerances, and doing it on a mass production basis is a war-time development that has important post-war significance. Modern Ace equipment and proved Ace ability will be able to meet manufacturers' requirements for accuracy, and do it at a price that would have been impossible not so many years back.

Now is the time to reserve your production capacity. Let us quote you on small parts or assemblies involving stamping, machining, heat-treating, or grinding. Send blueprint, sketch or sample.

CURRENT CAPACITY AVAILABLE

CYLINDRICAL GRINDING—Multiple banks of widely varying internal and external cylindrical grinders are available for outside diameters up to 12″ by 24″ between centers . . . and inside diameters as small as 1/16″ or as large as 4″ by 2¼″ long.

THREAD GRINDING—Our battery of Ex-Cell-O and J & L Thread Grinders equips us to give you tolerances of .0001″ on all Standard V Threads, Acme and Square Threads, and on single or multiple leads. All sizes up to 5″ diameter with threads 8″ long, on parts up to 20″ between centers.

ACE

ACE MANUFACTURING CORPORATION

for Precision Parts

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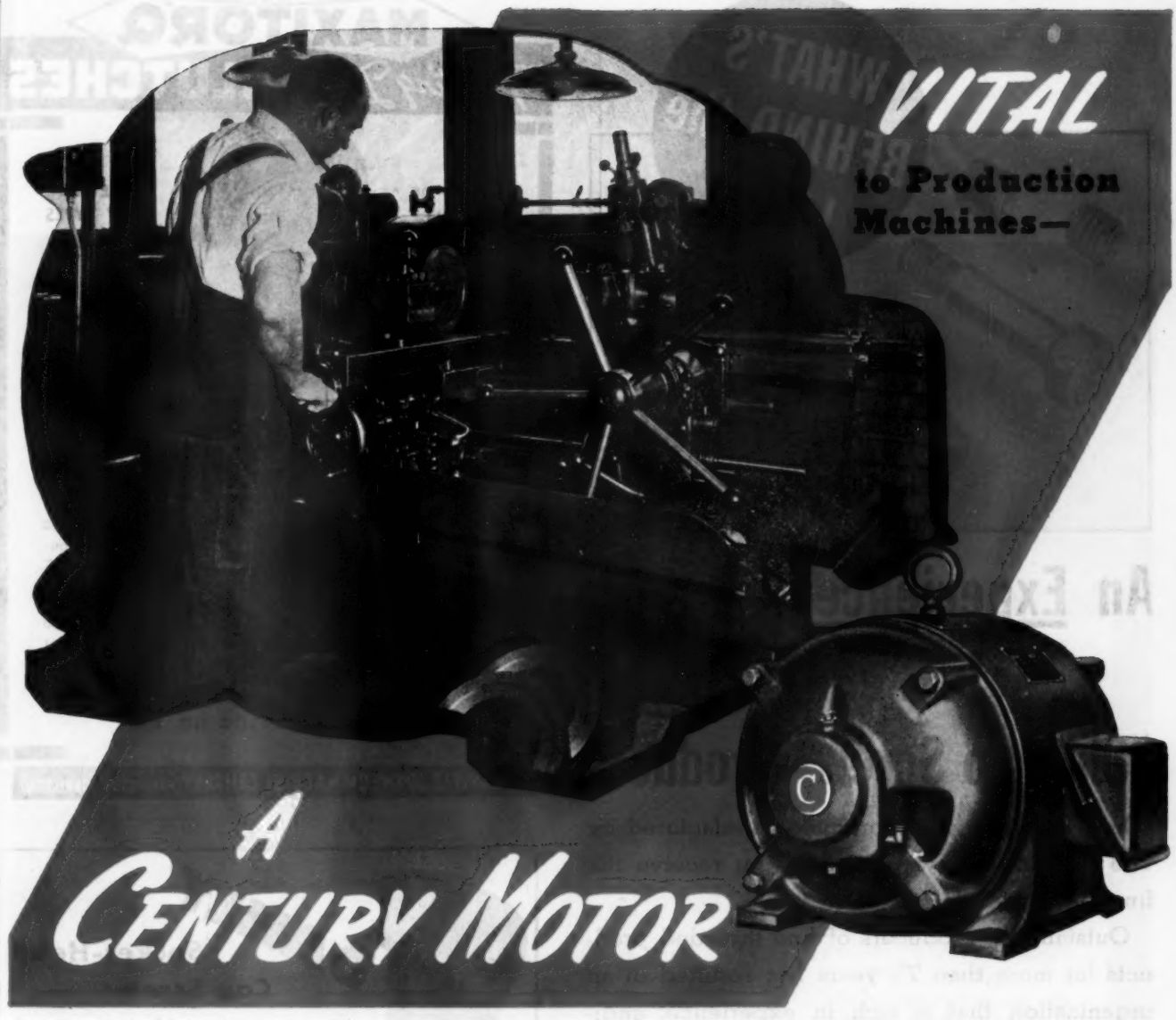

Can Be Matched to the Exact Requirements of Your Machine

Frequently hidden from view in the base of the machine—usually neglected by the user—that's why there's extra quality, dependability, durability built into Century Motors. They are production tools, too—a component part of the production machines they drive.

Century Motors run quietly and continuously with an unusual freedom from vibration that contributes to precision workmanship, particularly on machine tools.

As a result of many years of working closely with design engineers, Century Application Engineers have the knowledge and experience that enables them to accurately match the correct Century Motor to your machine. There is a wide range of AC and DC types and sizes from 1/20 to 600 horsepower from which to choose.

Specify Century Motors on all your electrically powered equipment. Engineered to the functional characteristics of the machines they drive to assure top performance—Century Motors are a vital factor in producing a better product at a lower cost.

Century C MOTORS

431

CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

An Experienced Factory Is Behind "Chicago Screw" Products

When you specify any product manufactured by The Chicago Screw Company you receive the finest there is.

Outstanding producers of fine threaded products for more than 73 years has resulted in an organization that is rich in experience, engineering ability and modern production facilities. Every piece is manufactured with the care and precision accorded a fine watch. Machining is done on the most modern precision equipment designed and built to maintain the closest production tolerances resulting in a product of increased strength, greater accuracy, perfect uniformity and improved appearance.

By any and every test or comparison—"Chicago Screw" Products are unsurpassed for the needs for which they are made.

ARMY E NAVY

These Fine Products are sold only thru Authorized Distributors

THE CHICAGO SCREW CO.
ESTABLISHED 1872
1026 So. Homan Avenue Chicago 24, Ill.

TRADE MAXITORQ MARK
Floating Disc **CLUTCHES**

SINGLE OR DOUBLE

WET OR DRY TYPES

SO TROUBLE-FREE

If you were to specify what you want in a clutch for your new machine tool, these features would surely be included. Compact construction; simple design; positive "in" and "out"; no drag, abrasion or heat in neutral; instant response to controls; easy adjustment; . . . and a long, trouble-free life.

Well . . . here you are! The MAXITORQ floating disc clutch has all these features and in addition it is assembled, adjusted for tension, and taken apart WITHOUT THE USE OF TOOLS.

Interesting, if true, you may say . . . but won't you also let us prove it? Tell us your needs for clutches . . . let our engineers submit solutions with standard Maxitorqs, ¼ to 15 H.P. at 100 R.P.M.

SEND FOR CATALOG NO. A83

THE CARLYLE JOHNSON MACHINE COMPANY · MANCHESTER, CONNECTICUT

DANLY Socket-Head Cap Screws

"Danly Knurled" is noted for high quality and accuracy. Specify it by name "Danly Knurled."

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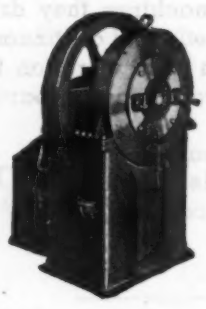
Ducommun Metals & Supply Company, 4890 South Alameda, Los Angeles

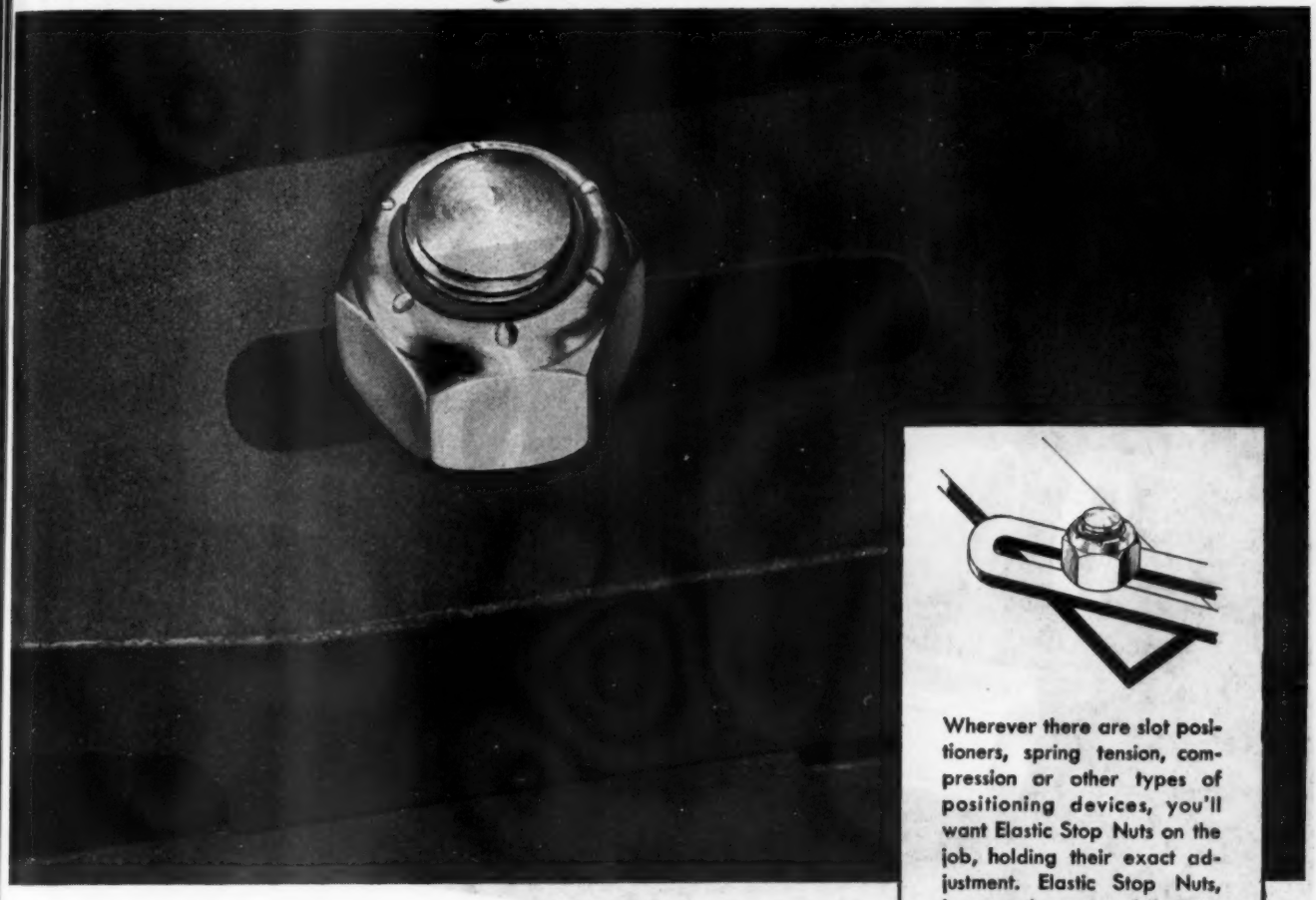


THE TORRINGTON ROTARY SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn.

THIS NUT *Knows its place*



Wherever there are slot positioners, spring tension, compression or other types of positioning devices, you'll want Elastic Stop Nuts on the job, holding their exact adjustment. Elastic Stop Nuts, because they successfully resist the effects of vibration, shock, impact and other loosening influences, are ideal for positive maintenance of position.

It Stays Where It's Put

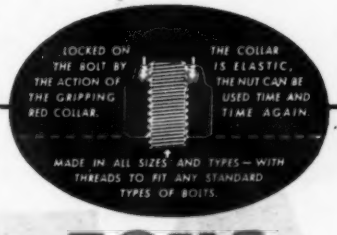
You'll always find the Elastic Self-Locking Stop Nut where you place it, because this nut always stays put. The Elastic Stop Nut holds an adjustment with a sure grip whether seated against a surface as in the slot positioner illustrated above or unseated on a threaded part.

The Elastic Stop Nut uses its head —because built into it is a red collar. This is an elastic compression collar that molds itself to the individual threads of the bolt, locking tight.

You need no jam nuts, cotter pins or other locking auxiliaries when you use Elastic Self-Locking Stop Nuts. They refuse to loosen, creep or "back off" under the toughest, most critical operating conditions. Yet they never rust or freeze in place and can be easily removed when necessary.

Proved in billions of wartime applications, Elastic Self-Locking Stop Nuts give definite insurance against loose nuts and consequent delays, breakdowns and extra maintenance work. From delicate, precise aircraft installations to heavy-duty tank installations, these nuts with the red elastic collar have shown their gripping power. Elastic Self-Locking Stop Nuts are the sure way to greater safety, economy and reliability.

LOOK FOR THE RED COLLAR
THE SYMBOL OF SECURITY


LOCKED ON THE BOLT BY THE ACTION OF THE GRIPPING RED COLLAR.
THE COLLAR IS ELASTIC, THE NUT CAN BE USED TIME AND TIME AGAIN.
MADE IN ALL SIZES AND TYPES—WITH THREADS TO FIT ANY STANDARD TYPES OF BOLTS.

ESNA
TRADE MARK

ELASTIC STOP NUT CORPORATION OF AMERICA

Plants at: Union, New Jersey and Lincoln, Nebraska

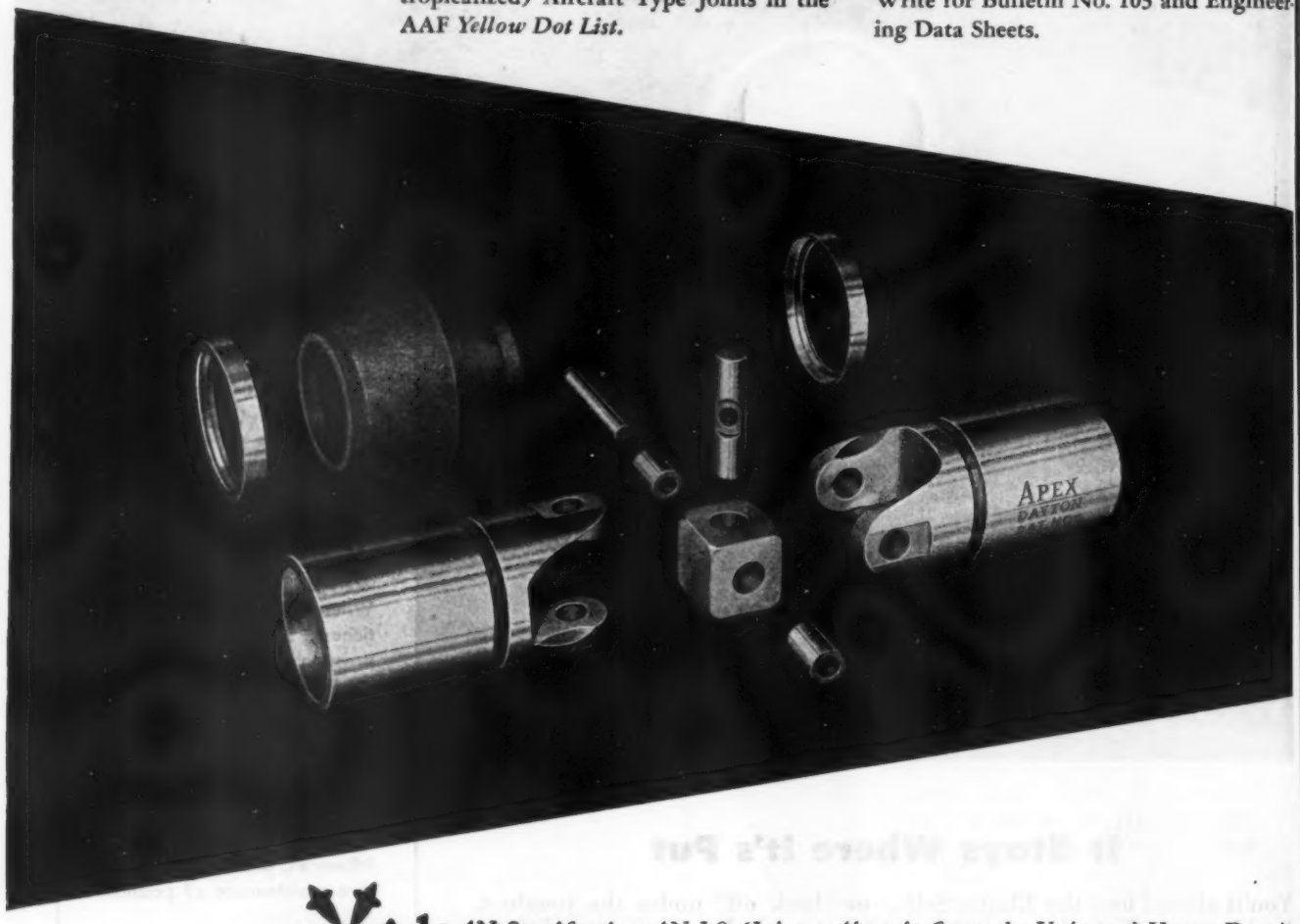
Sales Office: 1060 Broad Street, Newark 2, New Jersey

Only Apex meets and exceeds all requirements stipulated*

The hardest use to which Universal Joints can be put is on aircraft. The vibration and sudden, sharp changes in altitude and temperature bring about conditions met in no other applications. The best possible proof of Apex superiority is the fact that it is the only approved source of AN Standard, "Heavy-Duty," (winterized and tropicalized) Aircraft Type Joints in the AAF *Yellow Dot List.*

For industrial applications this joint will reduce your maintenance costs over any joint on the market.

Furnished in sizes from 3/8" to 1½"—with torque ratings from 300 up to 14,800 inch pounds—in all standard sizes or in specials engineered to your requirements. Write for Bulletin No. 103 and Engineering Data Sheets.



* 1 • *AN Specification AN-J-9 (Joints; Aircraft Controls, Universal Heavy Duty)*
2 • *AN Standard Drawing AN 271*
3 • *AAF Headquarters General Aircraft Specifications, R-1800-E-1*
4 • *AAF, ATSC, Eng. Div. Technical Note TN-TSESE-1*
5 • *AAF, ATSC, Eng. Div. Regulations 6-1 and T1-2000*
6 • *AAF Yellow Dot List*

APEX

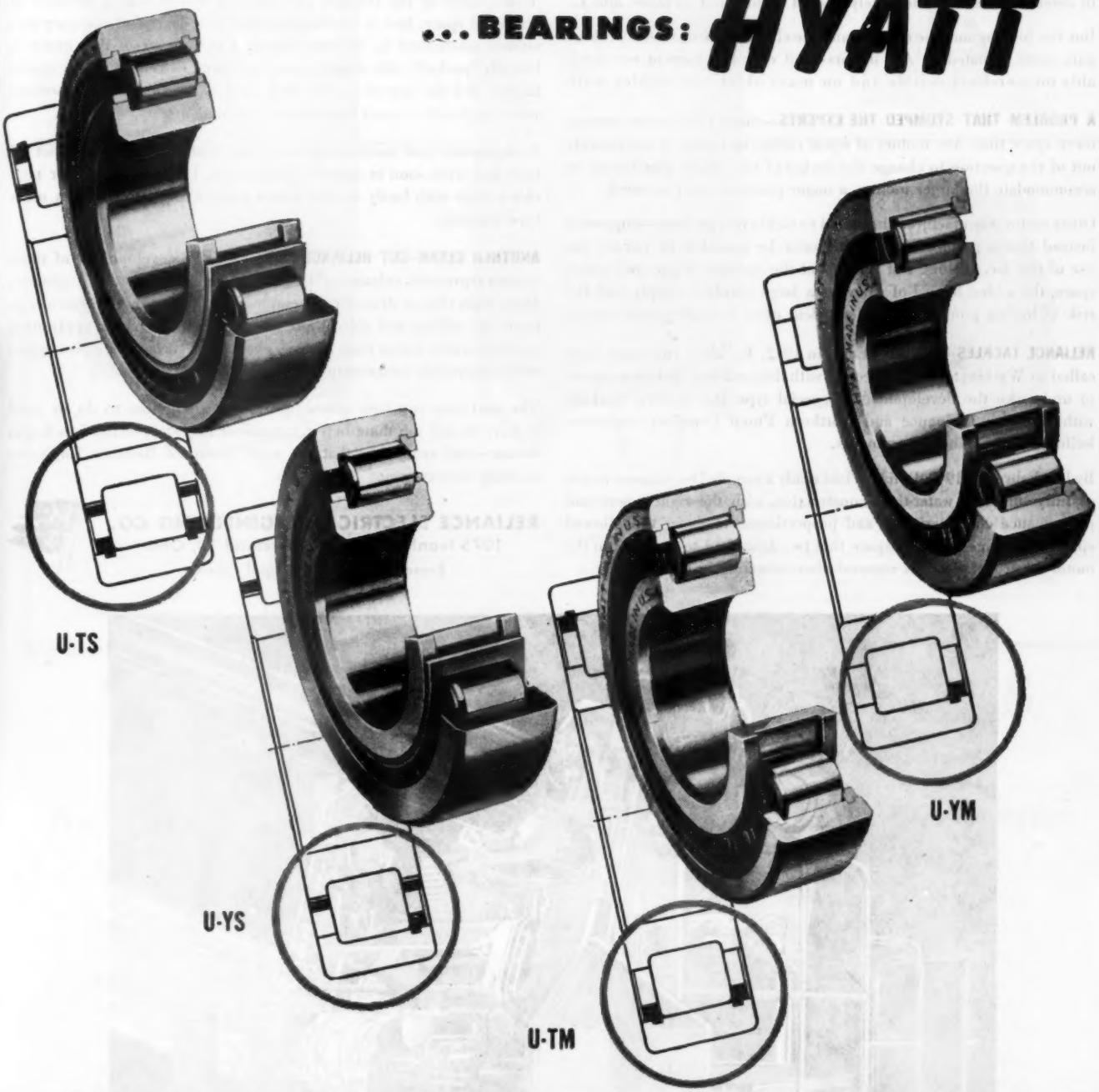
Universal Joints

THE APEX MACHINE & TOOL COMPANY, DAYTON 2, OHIO

In Flexibility of Design

NON-SEPARABLE TYPES HAVE THEIR PLACE, TOO

...BEARINGS: HYATT



In addition to the range of Hyatt Hy-Load Roller Bearings of the separable type there is a complementary series of non-separable bearings for assembly as a complete unit.

These bearings as illustrated are the U-TS, U-YS, U-TM and U-YM. The first two are built with a roller separator and the latter two a full complement of rollers.

Thus no matter what type of radial roller bearing your design calls for there is a Hyatt Roller Bearing to meet your required specifications. Into each is built high load capacity with precision.

Let us give you any further details you may wish or send you a copy of the Hyatt Hy-Load Bearing Bulletin.

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION

Harrison, New Jersey • Chicago • Detroit • Pittsburgh • Oakland, California

"IT CAN'T BE DONE!" said other motor men

. . . But Reliance Engineers Came Through

Early in the war it became evident our merchant ships needed 5-inch guns to defend themselves adequately against U-Boat and airplane attacks.

But the loading and the training and the elevating mechanisms of these guns were actuated by A-c. motors—and only D-c. current was available on merchant vessels and on many older type fighter craft.

A PROBLEM THAT STUMPED THE EXPERTS—Since D-c. motors occupy more space than A-c. motors of equal rating, and since it was entirely out of the question to change the design of the entire gun mount to accommodate the larger motors, a major problem was presented.

Other motor manufacturers hesitated to tackle this problem—suggested instead that a gasoline-driven alternator be installed to permit the use of the A-c. motors. But this meant the sacrifice of precious cargo space, the added hazard of carrying a large gasoline supply and the risk of having gun operation dependent upon a single power source.

RELIANCE TACKLES THE JOB—Early in 1942, Reliance engineers were called to Washington in connection with this problem. Reliance agreed to undertake the development of special type D-c. motors, working with Northern Ordnance and Northern Pump Company engineers, builders of the 5-inch gun mounts.

By late February, 1942, Reliance had ready a sample D-c. rammer motor of fully enclosed, water-tight construction, with the right power and performance characteristics, and proportioned to fit in the allowed space. So confined was the space that two dents had to be made in the motor cover to permit its removal after mounting in the gun.

PREVIOUSLY UNATTAINED ACCURACY STANDARDS—Next followed the development of the training and elevator motor which, because of restricted space, had to be manufactured to a degree of accuracy previously unattained in electric motors. The interior of this motor is literally "packed" with windings, necessitating extreme care in manufacture and the use of special tools and equipment. Novel methods were employed to meet lubrication requirements.

Both rammer and training and elevating motors successfully met all tests and were soon in quantity production, helping to arm our merchant ships with badly needed 5-inch guns. Many also serve on older type warships.

ANOTHER CLEAN-CUT RELIANCE "FIRST"—The development of these motors represents a clean-cut "first" for Reliance Application Engineers. More than that, it dramatically emphasizes the fact that Reliance engineers are willing and able at any time to tackle any motor application problem—with better than average chances of success, even on apparently impossible assignments.

The next time you have a new job for electric motors to do, or need to have an old job done better, remember this story of the 5-inch gun mount—and remember that the same group of Reliance Engineers is ready to serve *you*.

RELIANCE ELECTRIC & ENGINEERING CO.
1075 Ivanhoe Road • Cleveland 10, Ohio
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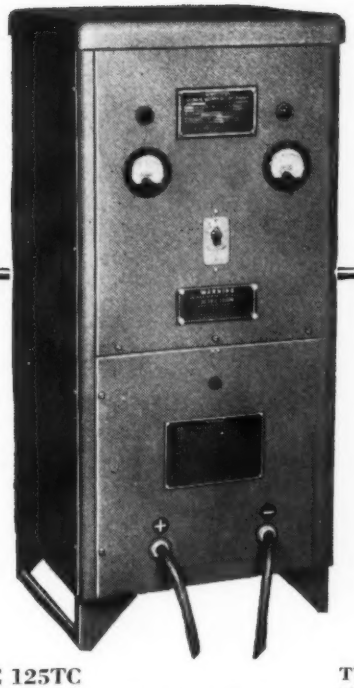
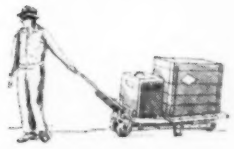
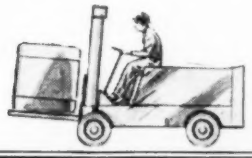
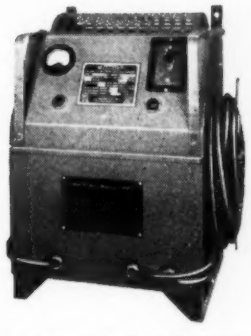
RELIANCE A-C D-C MOTORS

"Motor-Drive is More Than Power"









TYPE 175TC
for 230 or 460 volts 3 phase AC. *Charging Capacity:* (a) Lead Batteries—One 15, 16 or 18 cell battery of 500-750 ampere hours capacity, in 8 hours or less; (b) Nickel-Iron Batteries—One 24 or 30 cell battery of 500-750 ampere hours capacity, in 7 hours or less.

TYPE 125TC
for 230 or 460 volts 3 phase AC. *Charging Capacity:* (a) Lead Batteries—One 15, 16 or 18 cell battery of 250-500 ampere hours capacity, in 8 hours or less; (b) Nickel-Iron Batteries—One 24 or 30 cell battery from A-6 to C-8 type, in 7 hours or less.

TYPE 50TC—115 or 230 volt single phase operation—charges one 6 cell 200 ampere hour lead battery in 8 hours or less—one 10 cell 200 ampere hour nickel-iron battery in 7 hours or less.

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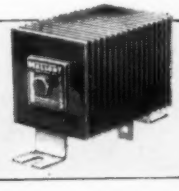
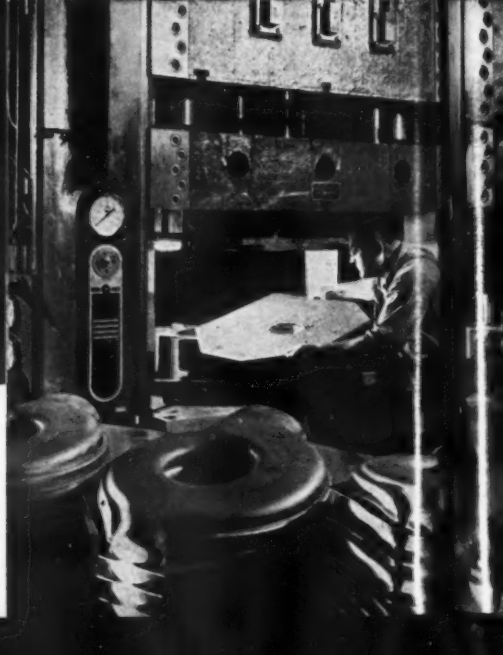


DEEP DRAWING



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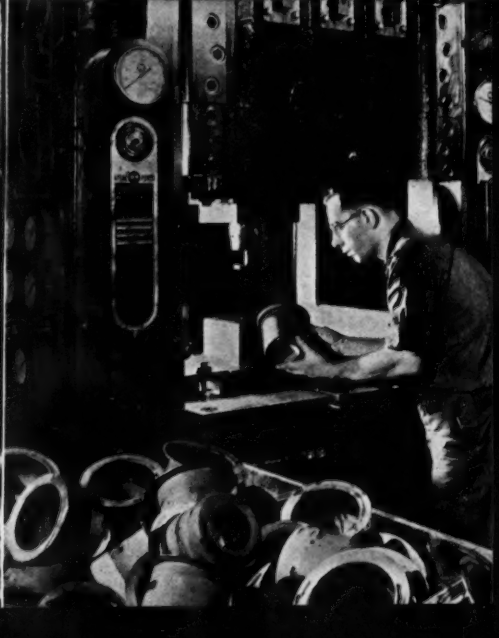

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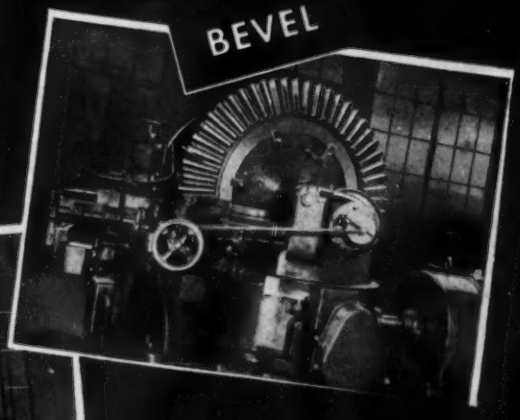

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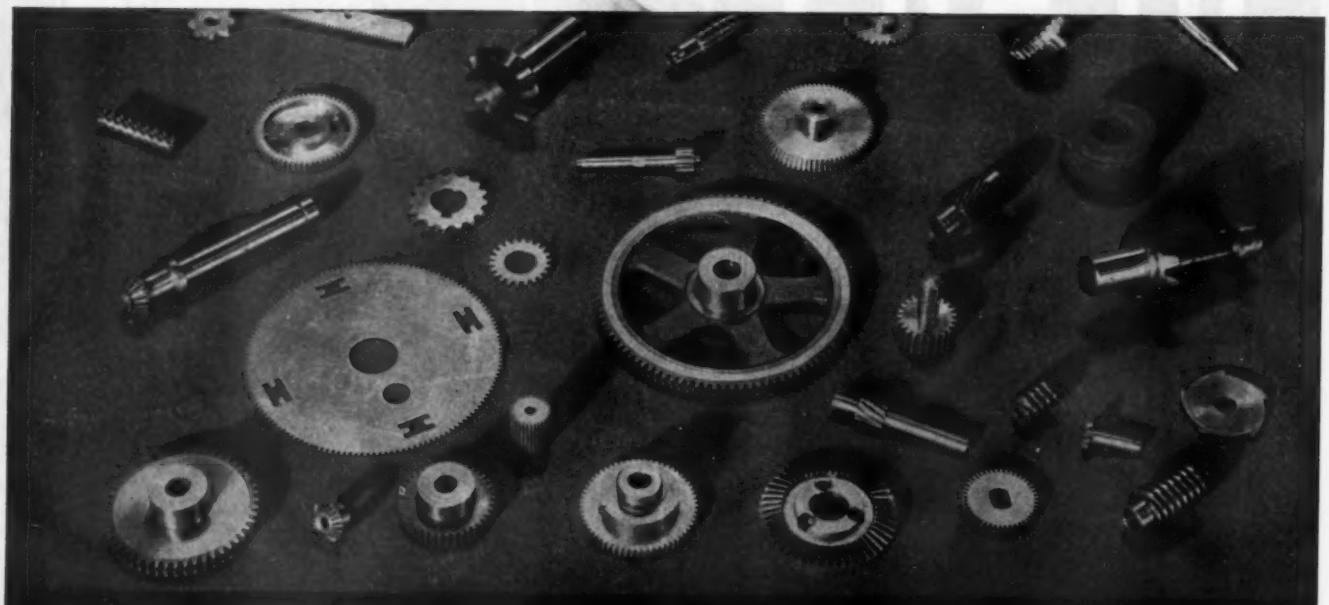

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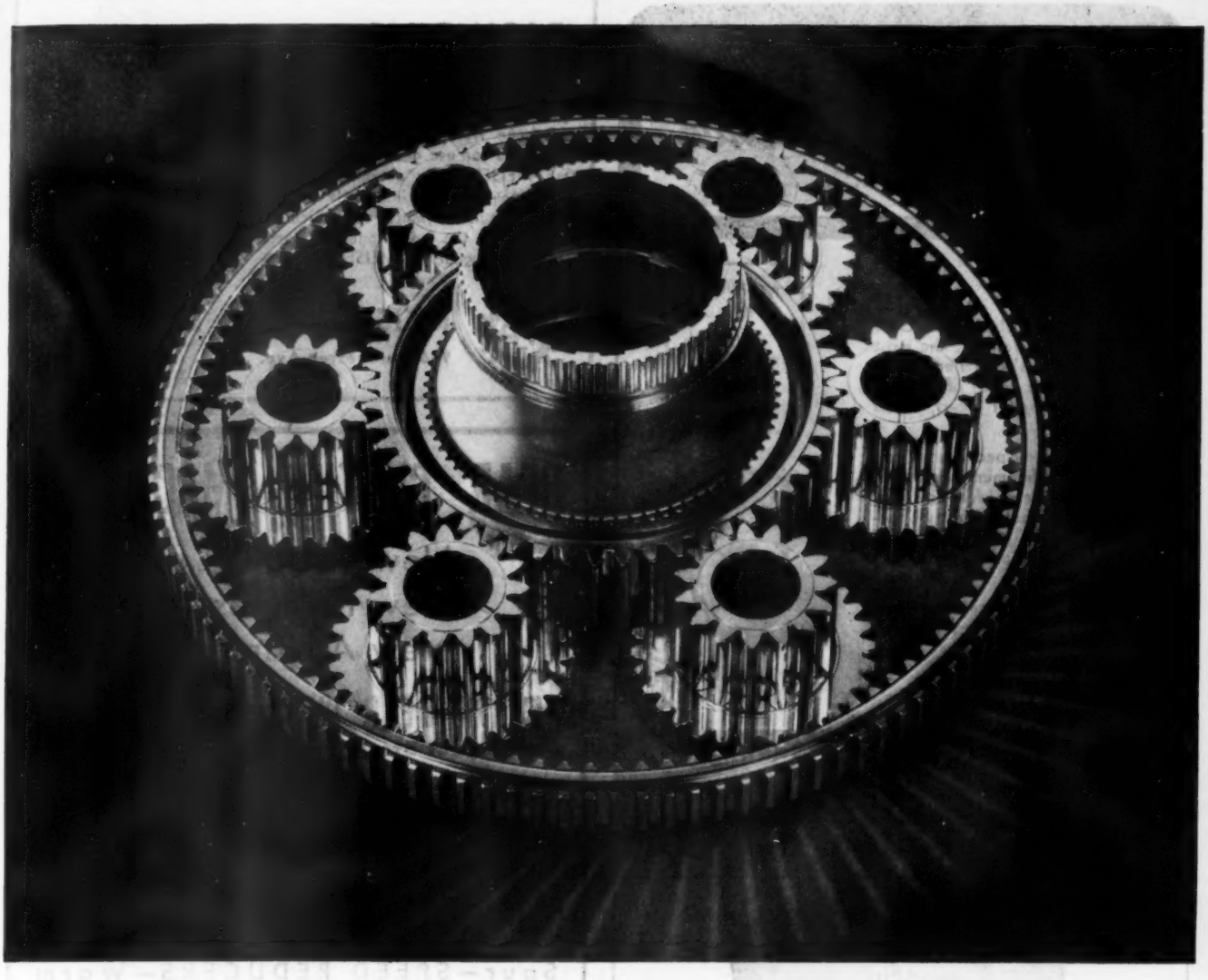

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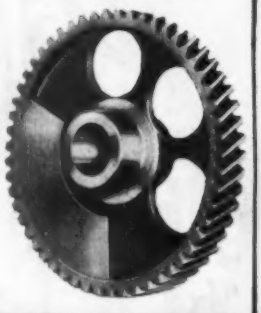

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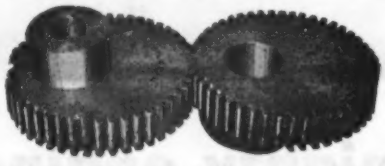

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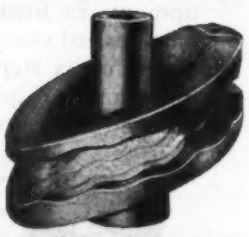

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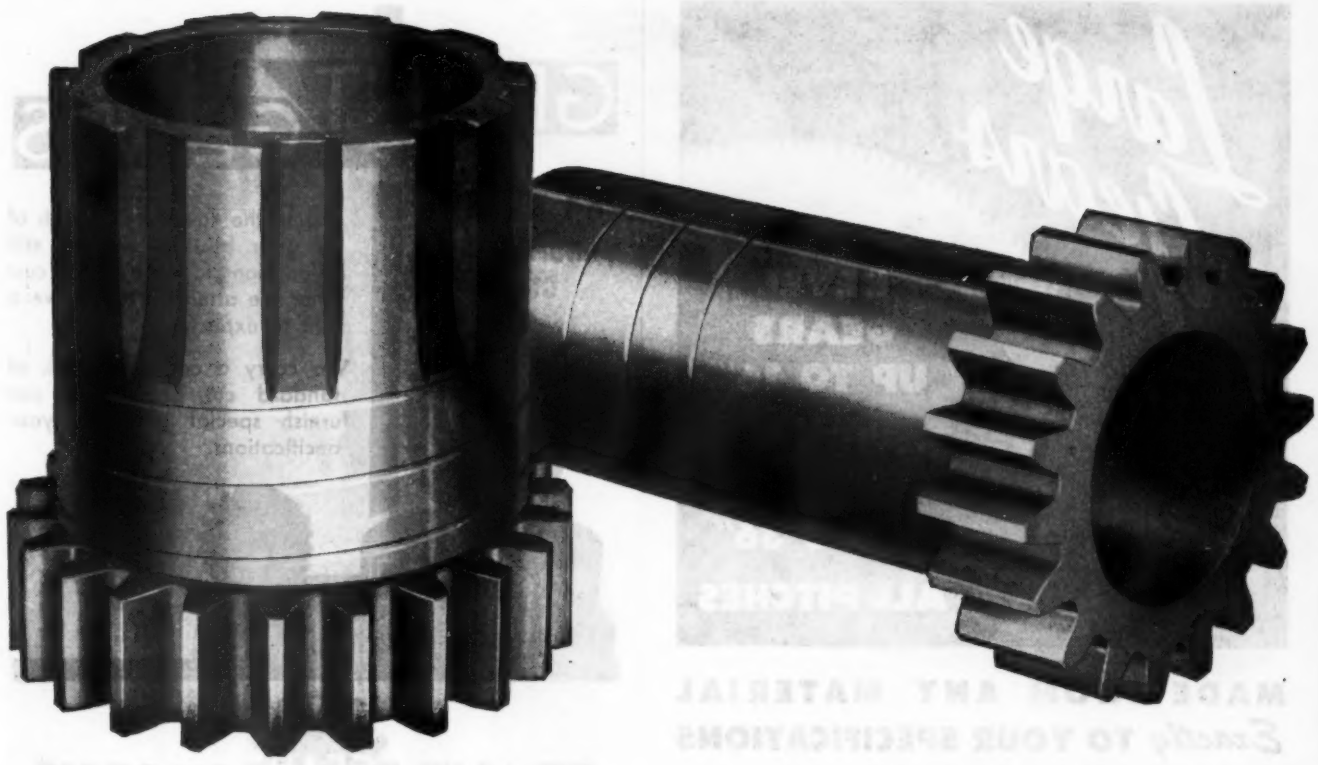

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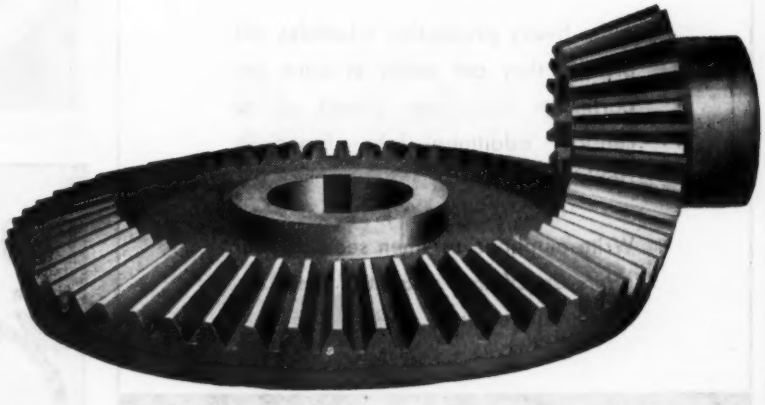

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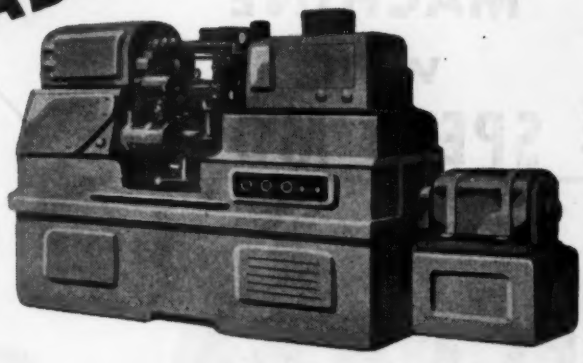

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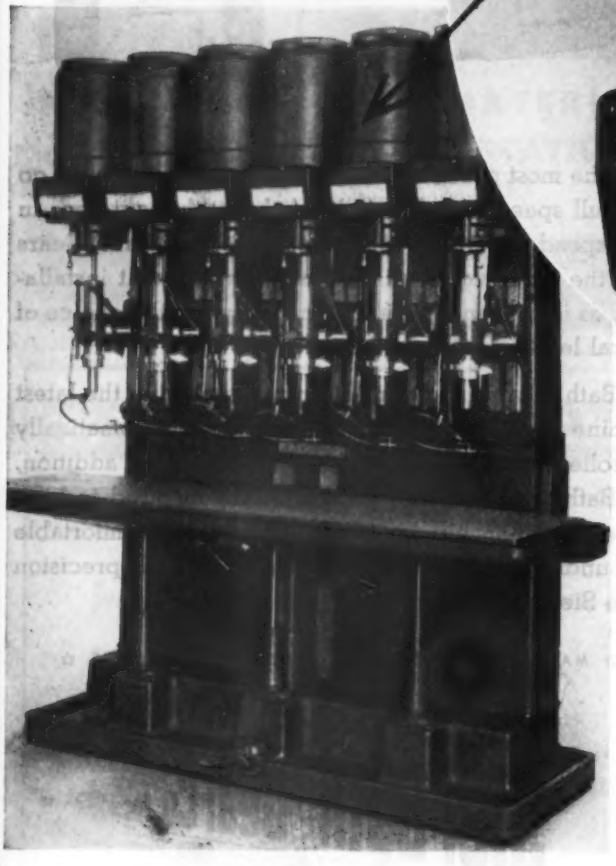
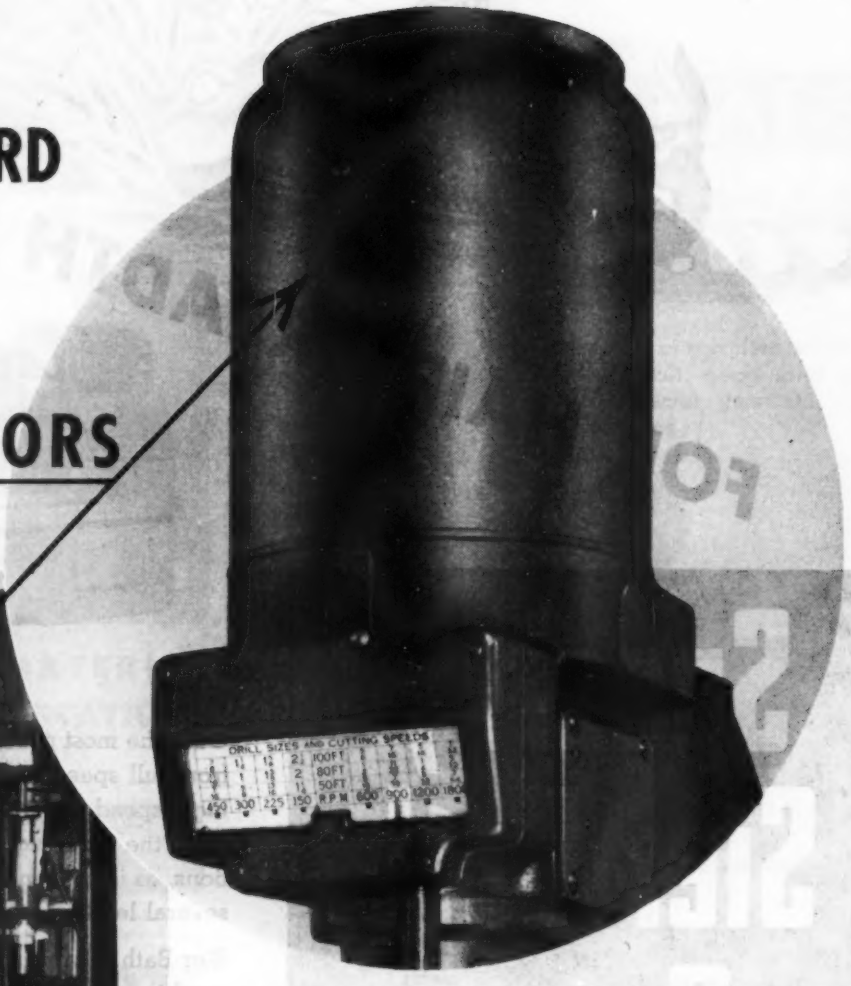
2 LMS LELAND-GIFFORD DRILLING MACHINE *with* 4 SPEED MOTORS





MOTORS ARE TOTALLY ENCLOSED, FAN COOLED, BALL BEARING MOUNTED.,

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Ball bearing back gear units can be furnished to give speeds lower than 600 R. P. M.

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Fast – Economical

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30 rivet holes are gang-punched per stroke in 3/16-inch plate with the Steelweld Press above in the production of shells for "Torrid Zone" warm air steel furnaces at the Lennox Furnace Co., Syracuse, N. Y. Bending and flanging operations are also performed with the machine. Recently this press played an important role in the fabrication of aircraft landing mats.

The press, as illustrated, is set up for two braking operations. The left side of the machine is used for flanging the plate and the right side for braking next to the cylindrical section. Back stops make it easy to produce accurate bends quickly.

The factory manager of Lennox Furnace declares this Steelweld: "A very good machine that is kept busy with all of our braking work."

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CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

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6,000,000-lb. capacity Elmes hobbing or die sinking press—Model No. 5389. Metal side shields and a bullet-proof glass front shutter enclose work compartment. A micrometer depth gage indicates slide movement. Compact, self-contained, with integral pump and Elmes simplified controls. Made in all sizes and capacities.

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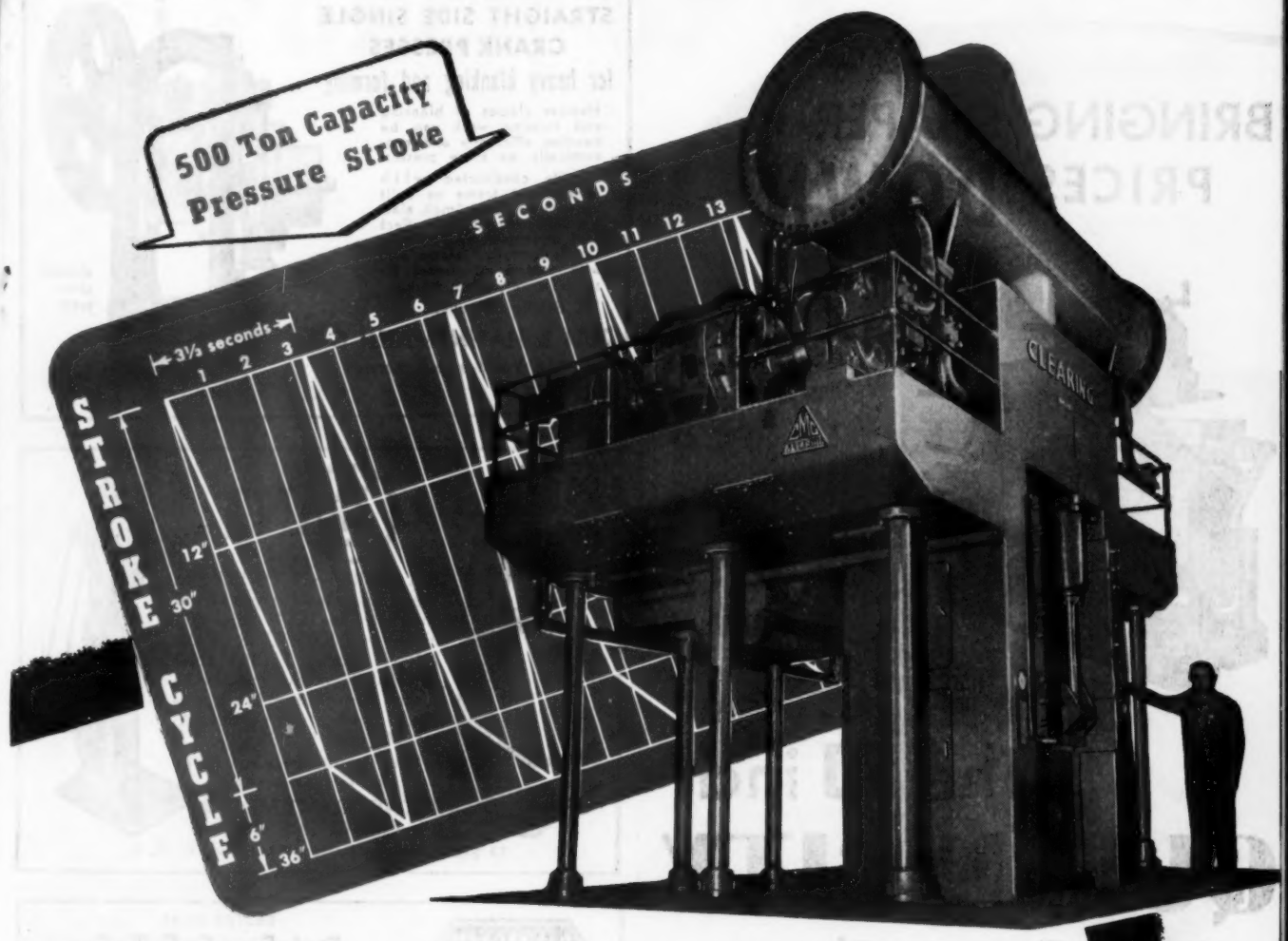

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Nowadays there's no need to settle for anything less than exactly the kind of forging press you want and need. Take for example the latest Clearing Hydraulic Forging Press above.

This product of Clearing engineering skill and ingenuity was built to meet certain specific conditions. With 500 ton capacity and a 62" x 42" bed area, the ram travels up to 1800" per minute on approach, 270" per minute on the pressing stroke, and 2160" per minute on the return. Clearing design provides other features such as automatic cycle control, gib guided slides and precision inching control for diesetting.

Probably your forging press requirements are different. The point is, whatever you want in a forging press, hydraulic or mechanical, you can get it in a Clearing machine. The many problem-solving features that have won such widespread acceptance for Clearing Presses can make money for you too.

Get all the facts about what Clearing equipment can do for your operations. Write us today about your press requirements, present or future.

CLEARING MACHINE CORPORATION
6499 West 65th Street • Chicago 38, Illinois

CLEARING
MECHANICAL AND HYDRAULIC PRESSES
for such operations as
DRAWING • PLASTICS • PIERCING • FORMING

CMC CLEARING

BRINGING SHAPER PRICES DOWN 20%

The 20 inch
QUEEN CITY
Super Twenty Shaper

The 20" Queen City Super Twenty Shaper marks a great advance in shaper design and construction which enables us to sell this machine at a price 20% lower than any comparable make.

The following are just a few of the outstanding features of this remarkable new shaper: the ram is of the V-type of wide bearing; clutch is dry multiple-disc type; the feed range is extremely versatile—from .008" to .191", quickly and easily changed; a high torque motor for power rapid traverse is standard equipment; an electrical limit switch permits complete motor control; Timken bearings are used throughout.

For superior performance, low initial cost and upkeep, the Super Twenty is an outstanding value.

AGENTS IN PRINCIPAL CITIES

QUEEN CITY MACHINE TOOL Co.
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WRITE FOR DETAILED LITERATURE

STRAIGHT SIDE SINGLE CRANK PRESSES
for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.

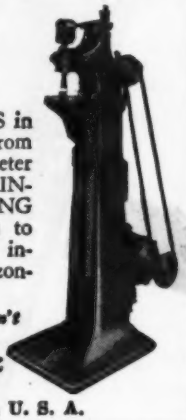
straight side press

ZEH & HAHNEMANN CO.
180 Vanderpool Street
NEWARK N. J.

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



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STANDARDIZED DIE SETS

BETTER-MADE
DIE SETS
AT LOWER COST
46 Styles—195,000 Sizes
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Send for our new catalog
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AUTOMATIC EQUIPMENT
The V & O Press Company, Incorporated
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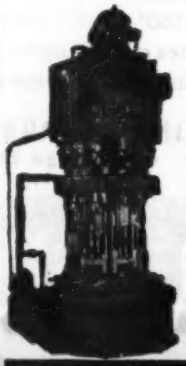

Vertical
ROTO-MATICS

Multiple spindle drill heads and automatic clamping provide added production.

Continuous operation is essential for maximum production. VERTICAL ROTO-MATICS are continuous operating, multiple spindle, non-indexing machines that are adaptable to a wide range of machine problems. . . . *Bulletins 110 and 120* may help you solve your problems. Write for them.

Davis and Thompson Co.
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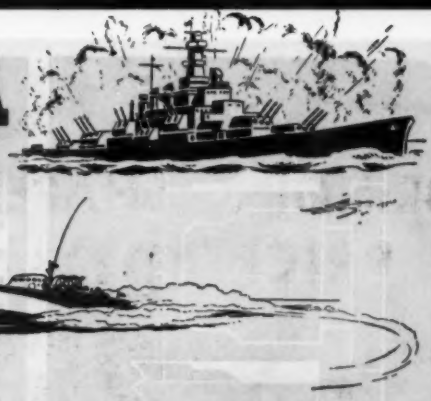
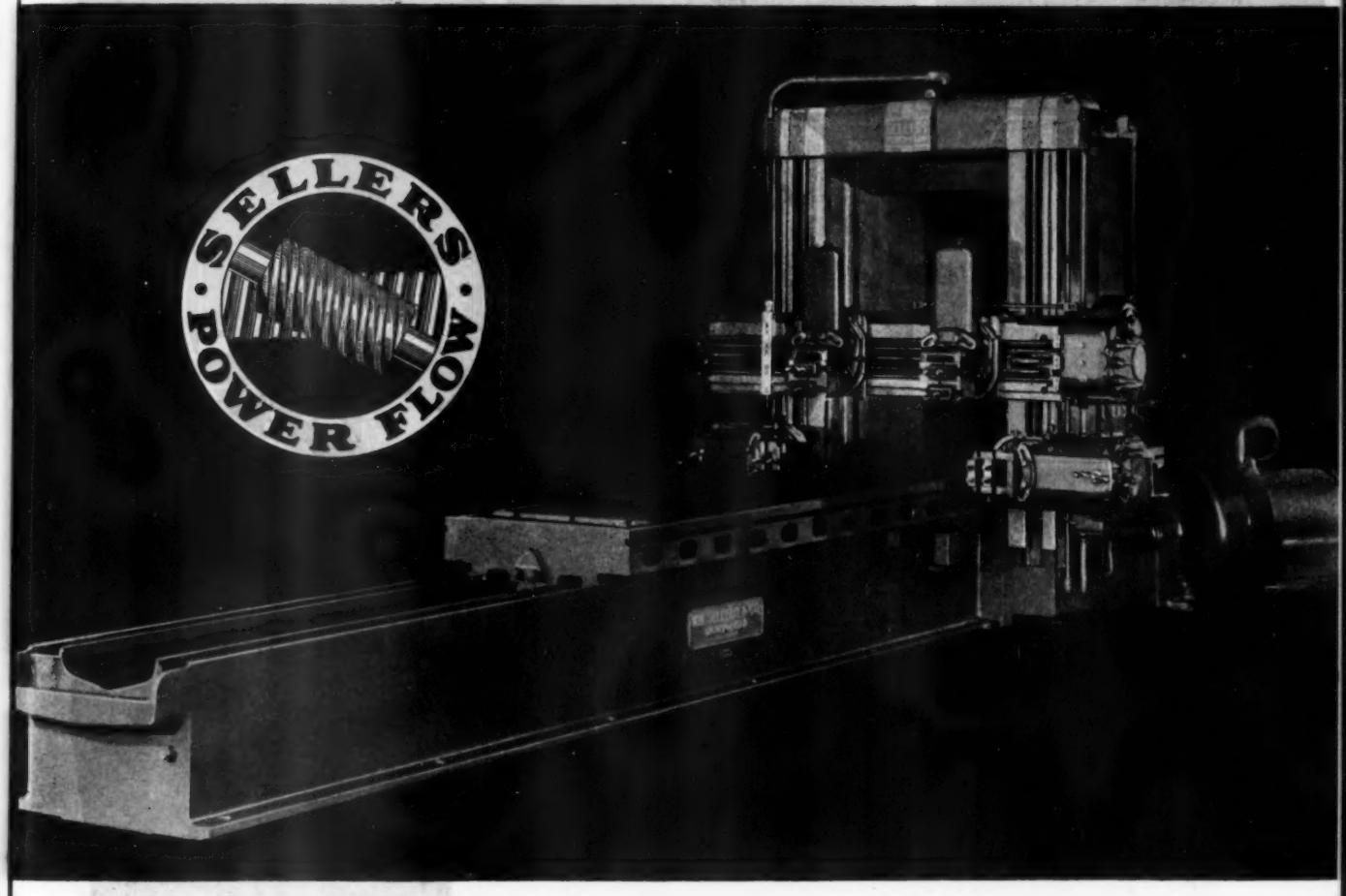
6411 W. Burnham St. Milwaukee 14, Wisconsin

FORCE OF A

Finesse of a





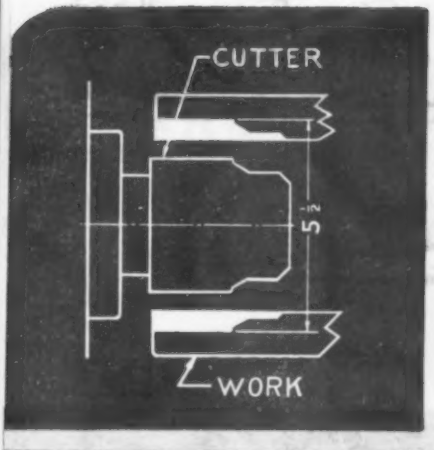
Combining the rugged power and strength of a battleship with the high-speed, precise control of a PT Boat . . . that's the Sellers POWER-FLOW PLANER! For the Sellers POWER-FLOW provides accuracy rarely found in a machine tool of such size and capacity.

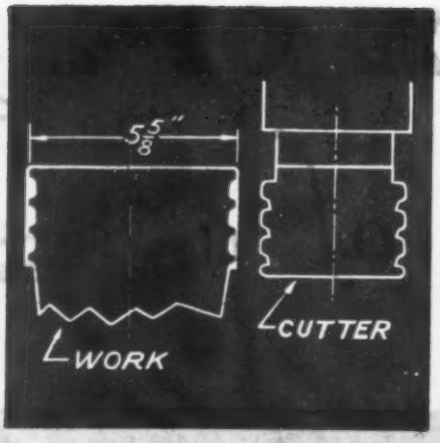
Production schedule look "impossible"? Tolerances approaching the hundred-thousandths? Put your confidence in POWER-FLOW for fast work, with almost infinite precision and non-chatter smoothness. For you are relying on almost a century of experience in machine tools.

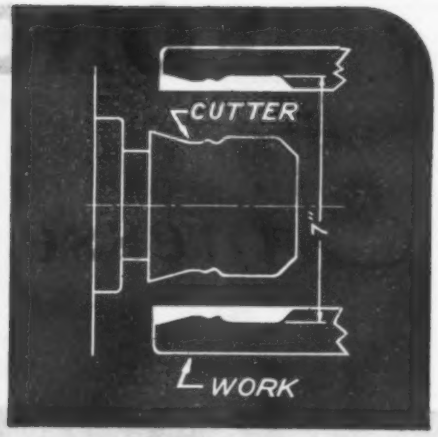
Learn how you can boost output at lower cost. Send for the new POWER-FLOW catalog, containing full details of design and operating principles.

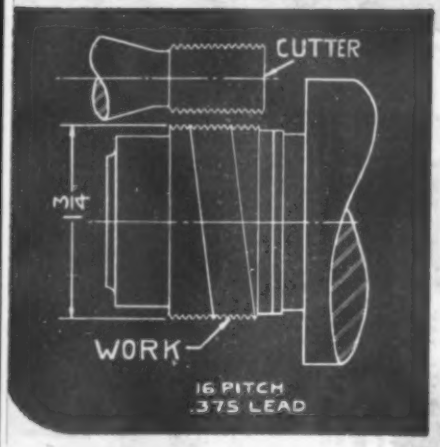
WM. SELLERS and Co., 1610 Hamilton St., Philadelphia, Pa.

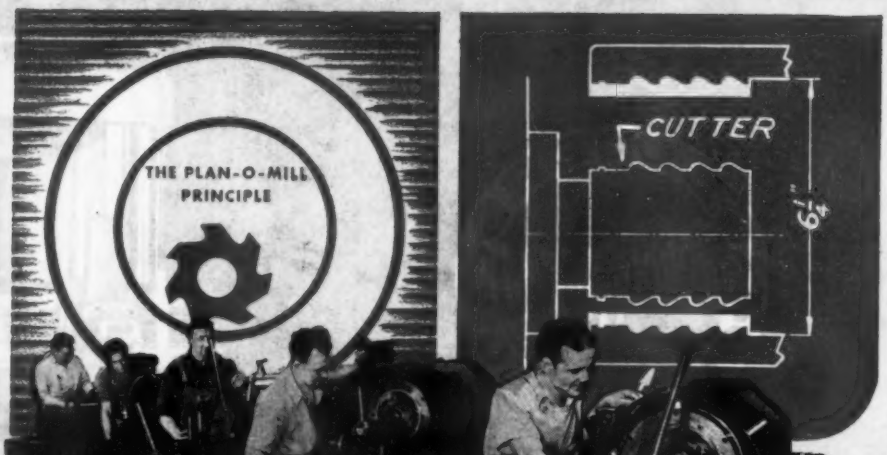
SELLERS PRECISION TOOLS SINCE 1848











For Victory Today— Prosperity Tomorrow— LOOK TO PLAN-O-MILL

For exceptional speed, accuracy and finish—at a saving of money, metal and manpower—look to Plan-O-Mill!

Plan-O-Mill provides a *better* method of form and thread milling. Plan-O-Mill offers outstanding rapid-production features, including General Electric's Thy-mo-trol for separate and complete control of feed-in and feed-around. Plan-O-Mill requires a minimum of skill to operate, a minimum of operator attention.

Shown above are typical examples of Plan-O-Mill production applications. If your war or post-war products involve internal or external threading or cylindrical forming, replace obsolete, wasteful machines with Plan-O-Mill. Contact your machinery dealer or write direct.

First

PLAN-O-MI

FIRST to install General Electric's remarkable new Thy-mo-trol—electronic feed control!

FIRST planetary to mill external threads with standard multiple thread cutter!

FIRST planetary to coordinate feeds and speeds!

FIRST to provide absolute control of

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

PLAN-O-MILL CORPORATION

1511 E. EIGHT MILE ROAD • HAZEL PARK, MICHIGAN

THREAD AND FORM PLAN-O MILLING CUTTERS

The Turn of Reconstruction

Reconstruction does not alone mean the rebuilding of structures razed by war . . . It demands equipment as well . . . As civilization rebuilds itself overseas, here at home factories will face huge orders for washing machines, refrigerators, automobiles and countless other needs "frozen" for long past. . . Vital to this order-filling is the *lathe* . . . For *your* metal turning, with the turn of reconstruction, specify the time-tested *Axelson heavy duty Lathe* . . . A *quality* machine operating at low per-piece cost on all types of work.

Axelson Lathes, of various lengths, are manufactured in 14, 16, 18, 20, 25 and 32-inch sizes.

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AXELSON LATHES

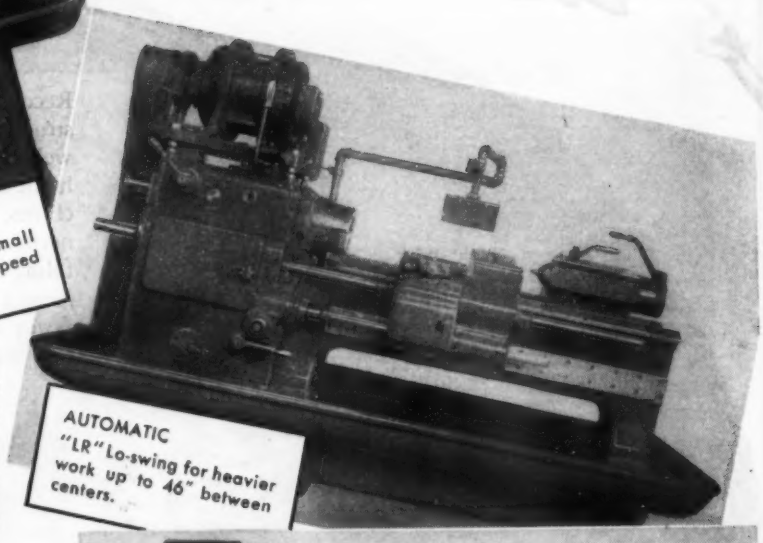
Dependable for over a Quarter Century

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

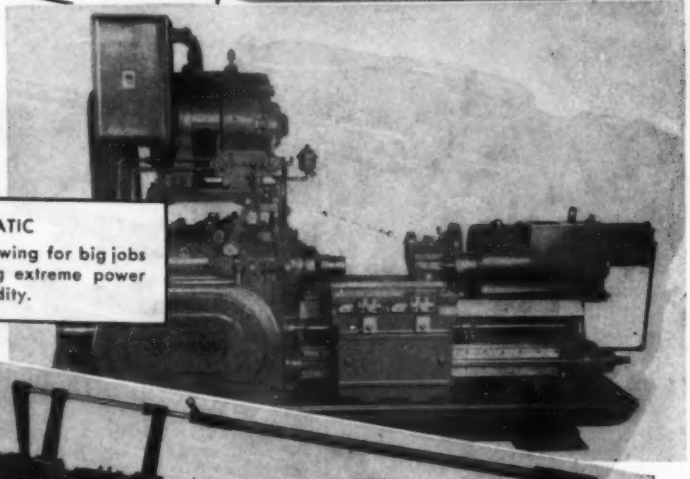
BUY WAR BONDS

THERE'S A *Lo-swing* LATHE FOR EVERY TURNING PROBLEM

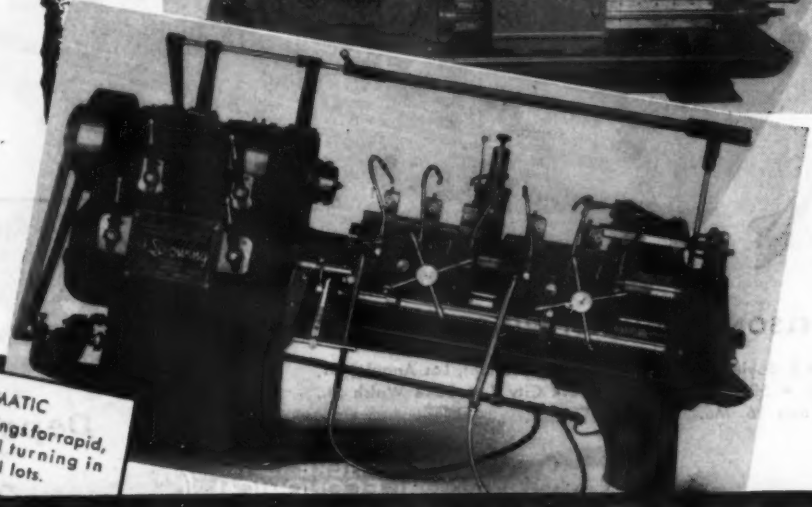
AUTOMATIC
Lo-swing IMP for small work requiring high speed and accuracy.



AUTOMATIC
"LR" Lo-swing for heavier work up to 46" between centers.



AUTOMATIC
R-14 Lo-swing for big jobs requiring extreme power and rigidity.



SEMI-AUTOMATIC
4"&8" Lo-swings for rapid, multiple-tool turning in large or small lots.

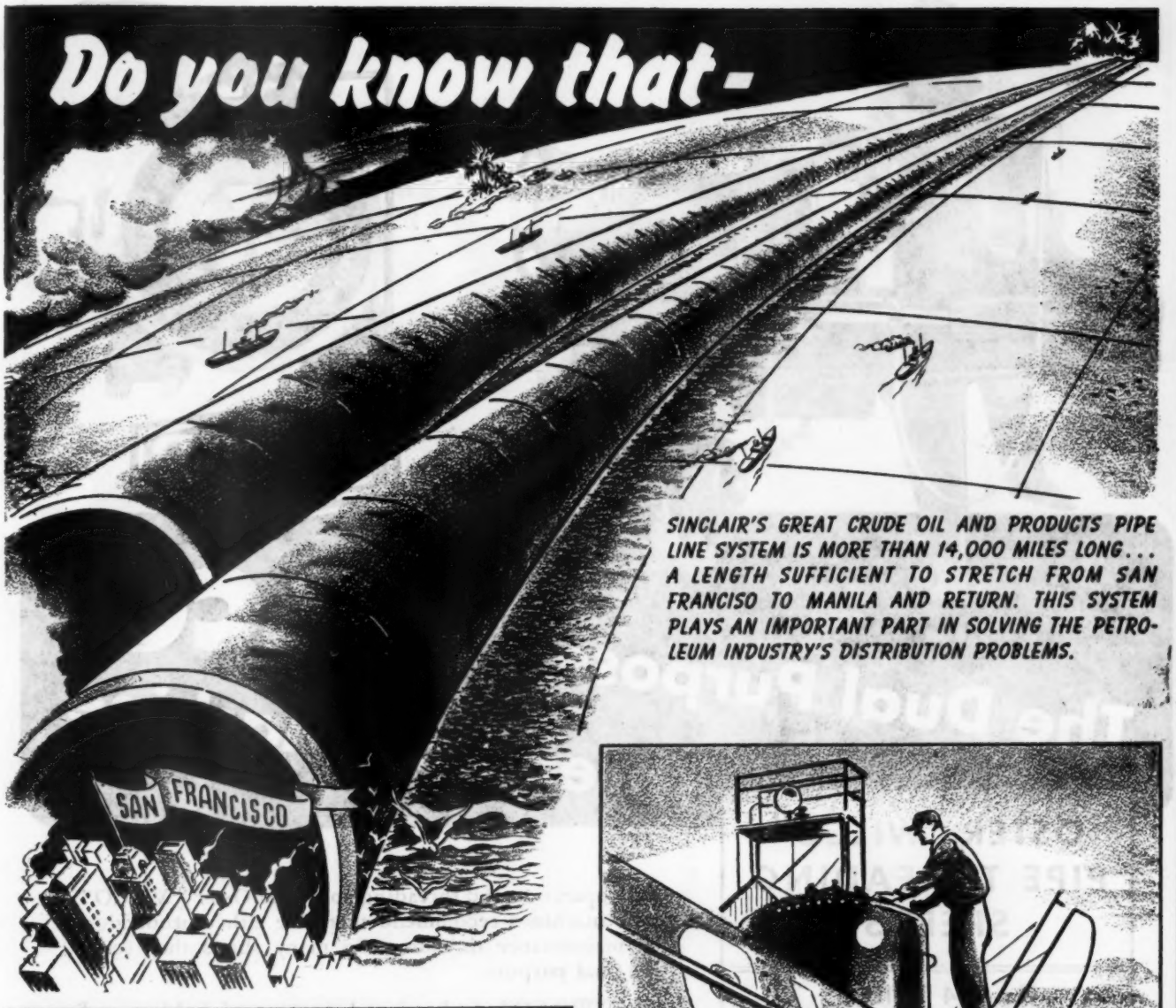
In the Lo-swing line Seneca Falls engineers provided the answer to practically every production turning problem. All Lo-swing Automatics embody the Seneca Falls Simplified Change-Over Mechanism which makes change-over on the average job merely a matter of minutes.

Lo-swing Lathes represent not only advanced design but the finest practice in quality machine tool building. Write for Condensed Catalog No. 42.

SENECA FALLS MACHINE CO.
Seneca Falls, N. Y.

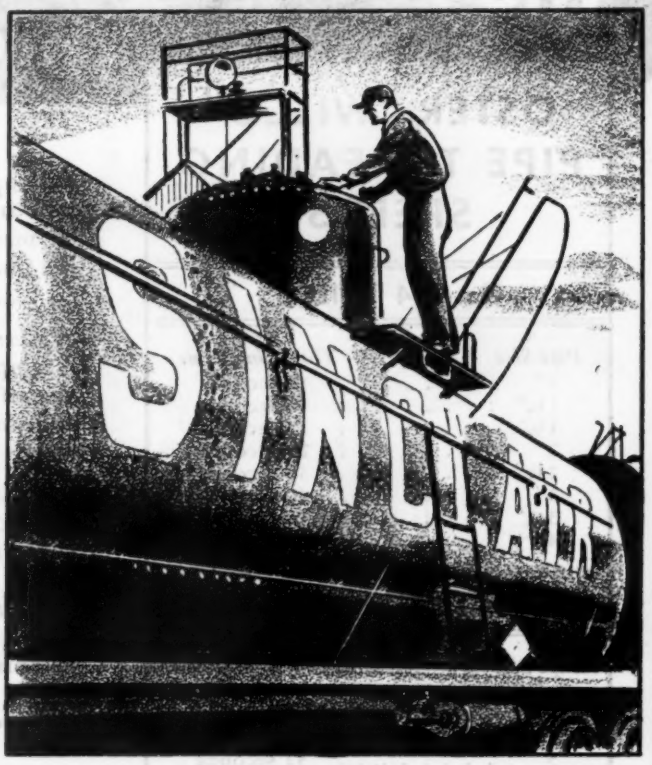
LATHE NEWS *from* SENECA FALLS

Do you know that-



SINCLAIR'S GREAT CRUDE OIL AND PRODUCTS PIPE LINE SYSTEM IS MORE THAN 14,000 MILES LONG... A LENGTH SUFFICIENT TO STRETCH FROM SAN FRANCISO TO MANILA AND RETURN. THIS SYSTEM PLAYS AN IMPORTANT PART IN SOLVING THE PETROLEUM INDUSTRY'S DISTRIBUTION PROBLEMS.

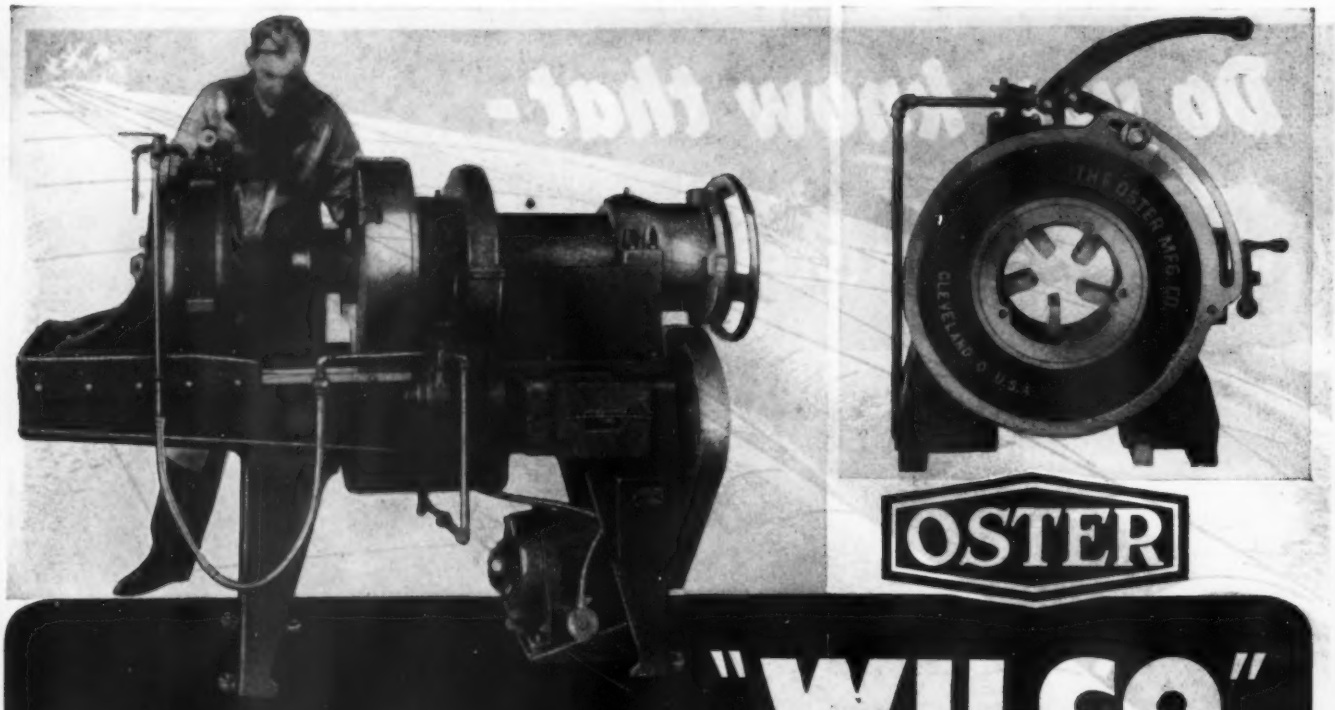
SINCLAIR GENERAL PURPOSE LUBRICANTS AND CUTTING OILS ECONOMICALLY MEET ALL SHOP REQUIREMENTS... PROMOTE BETTER MAINTENANCE OF EQUIPMENT, FASTER MACHINING, HIGHER PRECISION, FINER FINISH.



SINCLAIR OWNS AND OPERATES MORE TANK CARS THAN ANY OTHER OIL COMPANY IN THE UNITED STATES. THEY TRAVEL MORE THAN 325,000,000 MILES ANNUALLY TRANSPORTING PETROLEUM PRODUCTS.

SINCLAIR IS EQUIPPED TO SERVE YOU BETTER!

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.



OSTER

The Dual Purpose "WILCO" Threading Machine

OSTER "WILCO" PIPE THREADING SPEEDS!

No. 704 "WILCO"

Pipe Size	*Threading Time*
1"	16 seconds
1¼"	16 seconds
1½"	24 seconds
2"	25 seconds
2½"	38 seconds
3"	40 seconds
3½"	56 seconds
4"	58 seconds

No. 706 "WILCO"

Pipe Size	*Threading Time*
1½"	19 seconds
2"	20 seconds
2½"	30 seconds
3"	31 seconds
3½"	48 seconds
4"	49 seconds
5"	70 seconds
6"	74 seconds

Note: Above time studies based on cutting full American National Standard pipe threads at recommended speeds.

Easy operation and threading speeds of Oster "WILCO" pipe machines recommend them for either production or maintenance threading. In many shops they serve the dual purpose.

The "WILCO" die-head and one set of holders and chasers thread the standard range of each machine. A simple adjustment of the cam lever sets chasers to any size of pipe. The lever is equipped with a micrometer adjustment for extreme accuracy in setting chasers for any depth thread desired.

Regular equipment furnished with each machine includes one complete set of right hand, *high speed steel* pipe chasers with holders, threading all sizes within regular range; cut-off device with three centering guides; *high speed steel* cut-off tool; *high speed steel* reaming and chamfering forming tool; oil pump and reservoir; three-jaw, gripping chuck on front of spindle; four-jaw centering chuck on rear of spindle; motor of required standard specifications and non-reversing, magnetic controls.

Two "WILCO" Models

No. 704. Standard range 1" to 4" pipe. Extra range ½" to ¾" pipe. Bolt range ¾" to 3".

No. 706. Standard range 1" to 6" pipe. Bolt range 1" to 4".

There's an Oster Distributor near you. If you don't know his location, write us for complete details.

THE OSTER MANUFACTURING COMPANY, 2049 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.

Walker-Turner
RADIAL DRILL

The head on a Walker-Turner Radial Drill tilts to 45° in either direction. No need for angle vises and special set-ups in drilling, reaming and tapping angled holes. It speeds output, lowers production costs, improves machining flexibility.

The drill head operates anywhere within a 62" circle. Jackshaft assembly gives 16 spindle speeds from 160 to 8200 r.p.m. Has all the job-tested refinements of the Walker-Turner Drill Head for extra ruggedness, smoother running, easier operation. Write for detailed information today.

WALKER-TURNER COMPANY, INC. • Plainfield, New Jersey

PRICE $346.50
Guard Extra
(Slightly higher west of Rockies and in Canada)

walker-Turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

RETOOLED *by Buhr—*

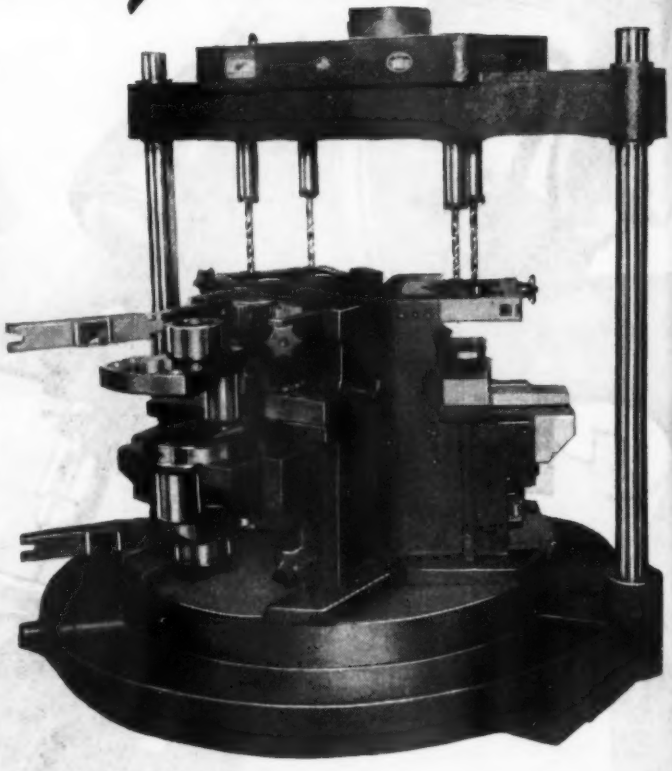
Typical of Buhr retooling is this equipment for a standard drill press. It drills two 27/32 holes and reams two .875 holes in aircraft crankshafts, and consists of:

4-spindle drill and ream head

3 holding fixtures and bushing plates mounted on a 24-inch 3-position index table with compound trough.

Crankshaft is loaded in front position, drilled in second position and reamed in third position.

IN ALL BUHR DRILL HEADS THE GEARS ARE SHAVED AND INDUCTION HARDENED FOR QUIETER, MORE ECONOMICAL OPERATION AND MORE PRODUCTION HOURS WITHOUT REPAIRS.



Buhr Machine Tool Co.

Green and Davis Streets
ANN ARBOR, MICHIGAN

GRAND RAPIDS

NO. 15
HAND FEED

SURFACE GRINDER

. . . a rugged machine for fine, accurate work

This high grade, motor driven machine will handle all work within its capacity with maximum convenience. Among the features which assure fine, accurate work and long precision service are the following:

. . . heavy, one-piece column and base
. . . precision ball bearing spindle
. . . careful guarding of wearing surfaces
. . . provision for wet grinding

This machine can be furnished with coolant system or dust collecting system.

Longitudinal Table Movement—19"
Transverse Table Movement—8½"
Vertical Movement—12"
Table—6"x18"

Send for illustrated literature giving further details.

GALLMEYER & LIVINGSTON CO.
330 Straight Street, Grand Rapids (4), Mich., U. S. A.

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of TRIMMING FORMED PARTS

and performing a host of other metal cutting jobs!

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind. Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.

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FRICTION SAWING *with* *Tannewitz*
HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

VARD is offering manufacturers a new service — Gage Engineering. If you are tooling up to get into real production on even as small an item as an egg beater, a lawn mower, a baby carriage or an auto accessory, spend your money before . . . not after getting into production. Gage Engineering is careful engineering analysis of your production problems with recommended inspection techniques and equipment ☆ Gage Engineering may save you enormous production costs. Gage Engineering, at pennies or fractions of a cent per item, can save costs of shutdowns, labor loss, material spoilage and huge expenditures of executive time. Gage Engineering is production INSURANCE. VARD Gage Engineers are practical, manufacturing and machine production men.

VARD Gage Engineering is quickly available, wherever you are. The costs are reasonable. Write us, outlining your production program. We'll explain fully our services and charges.

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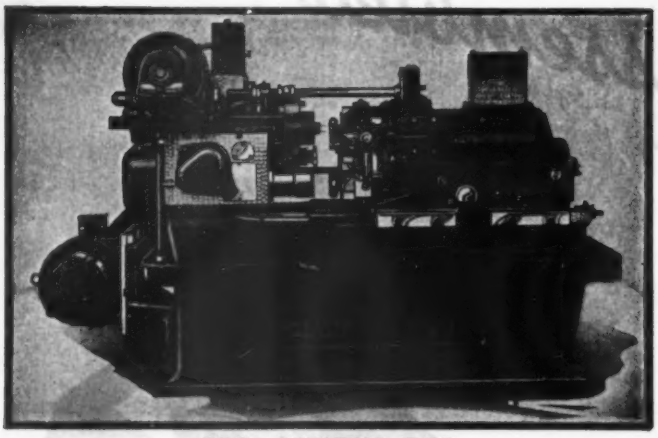
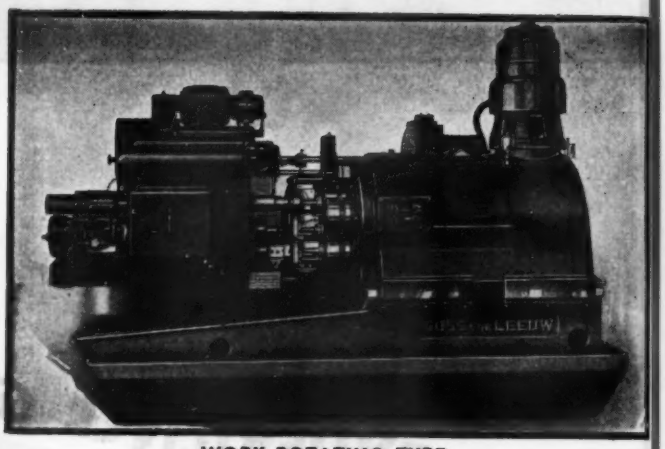
ARMY E NAVY

GOSS & DE LEEUW
Multiple Spindle
CHUCKING MACHINES



TOOL ROTATING TYPE
4 Spindles • 5 Chucking Positions



WORK ROTATING TYPE
5 Spindles • 6 Spindles • 8 Spindles

Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

The many modern features offered in these machines are fully described in catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

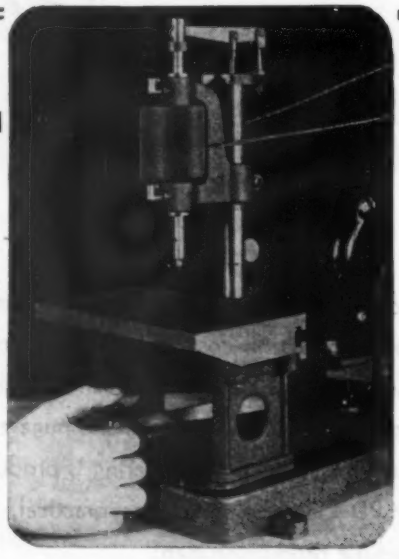
LORD & DAVIS SUPER-SENSITIVE HIGH SPEED DRILL PRESS

. . . for the *most exacting* **PRODUCTION NEEDS**

Speeds from 3,000 to 23,000 R.P.M.

The extreme sensitivity of this modern machine results in minimized breakage of extremely small drills as well as suitability for use under the most rigid precision requirements.

Proper surface speeds are attained by providing eight standard spindle speeds from 3,000 to 23,000 R.P.M. to cover all drill sizes from .004" to 1/16" diameter.



This machine is made with one, two, three or four spindles. On Multiple spindle units, each spindle may be run at an independent speed. Positive stops are available for all drilling spindles.

Write for Illustrated Bulletin, giving full details

MASSASOIT MACHINE CO.
220 GROVE ST., WALTHAM 54, MASS.

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.
CONNEAUT • • • OHIO

Rugged...

No. 1-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic table feed.

Simple...

No. 2-20V . . . 20" table travel . . . vertical spindle with speed range 32 to 1284 R.P.M. . . . 42" x 12" table.

Efficient...

No. 2-20DS . . . Double Spindle for two milling operations at same time . . . 20" table travel . . . 42" x 12" table.

No. 1-14 . . . 32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

No. 1-14V . . . 18" table travel with full automatic cycle . . . vertical spindle with speed range 115 to 3000 R.P.M.

No. 1-M . . . Hand feed to table and head . . . 25" x 9" table . . . 1 H.P. . . . head counterbalance is adjustable.

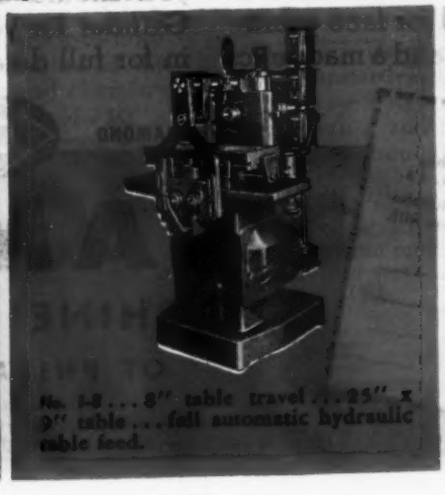
Cost-cutting Dependability with

KENT-OWENS

Milling Machines

Write for Bulletins • KENT-OWENS MACHINE CO., TOLEDO, OHIO

No. 1-V . . . Hydraulic vertical head feed . . . 5½" head travel . . . 25" x 9" table.



No. 1-S . . . 8" table travel . . . 25" x 9" table . . . full automatic hydraulic table feed.

KENT-OWENS REPRESENTATIVES

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BUFFALO
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DALLAS
Hamilton-Hoover Mach'y Co.

DAYTON
Geiger Mach'y Company

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QUESTION: IS THERE A BETTER WAY TO FACE THIS PRESSED STEEL FRAME?

Look over this job and decide how you'd do it. It's a frame measuring 12½" x 20½" overall, pressed from ⅛" steel. Must be flat to assure proper alignment of mating parts. Could you machine it? Hardly.

It is, however, a natural for face grinding. With a simple fixture and a magnetic chuck, facing of the frame, two sides, is the work of only a few seconds on a Diamond Face Grinder.

Versatility in handling work of this nature is only one of the many reasons why you should consider a Diamond Face Grinder for your shop—and now. Write in for full details.

"THE DIAMOND (D) THAT CUTS YOUR COSTS"

MAIL TODAY FOR NEW FOLDER

Diamond Machine Company of Philadelphia
2405-D Aramingo Avenue, Philadelphia 25, Pa.

Gentlemen: Please send me promptly your Bulletin 44-G which shows how to speed-up production with the Diamond Face Grinder.

Name _____ Title _____

Company _____

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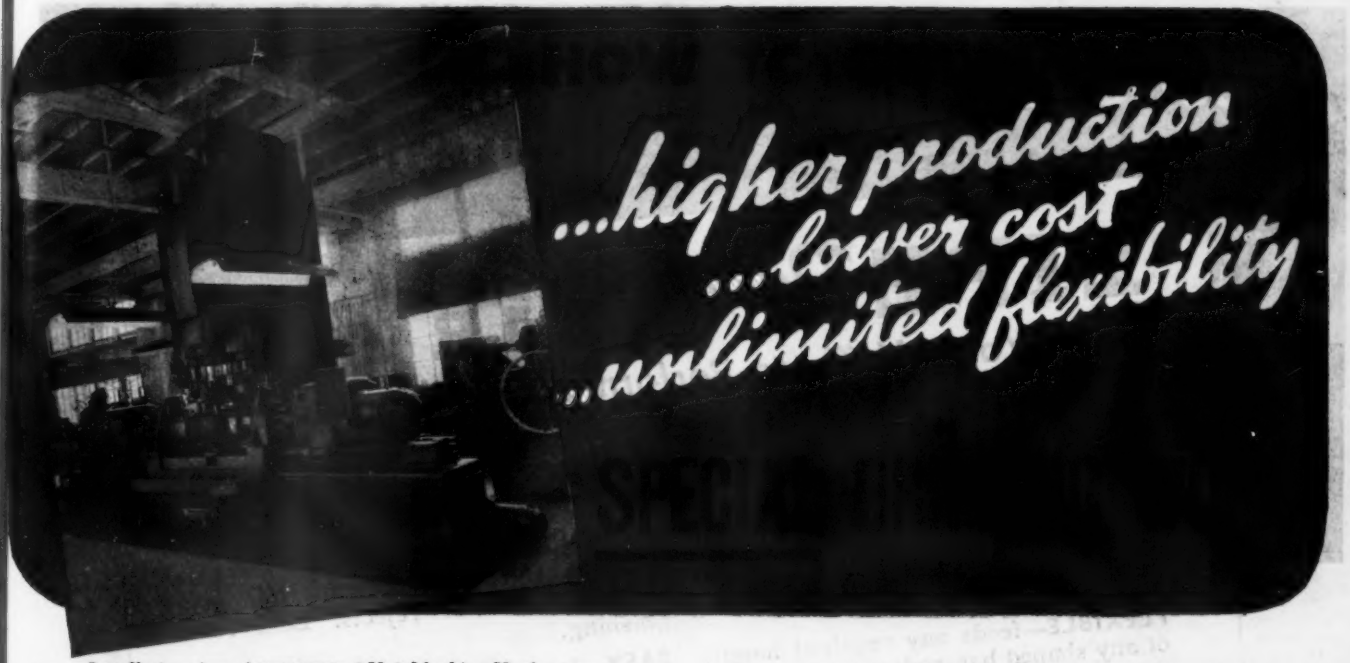
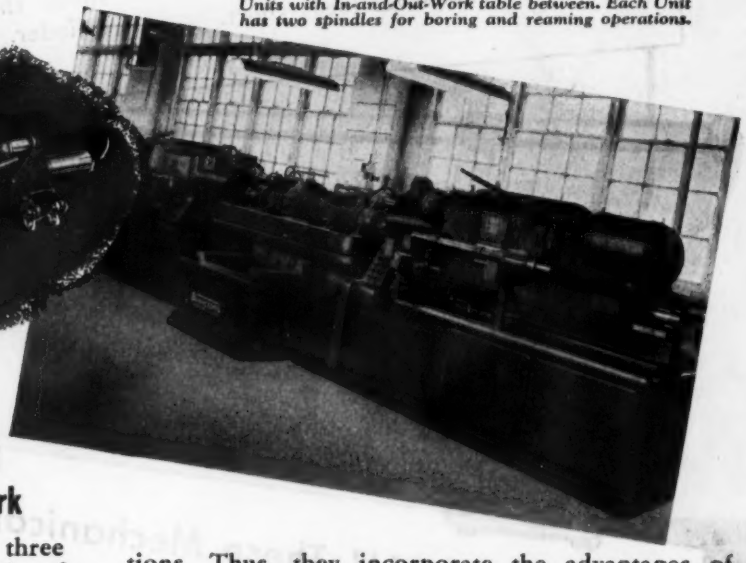
DIAMOND MACHINE COMPANY OF PHILADELPHIA



Installation view of BARNESDRIL *3-Unit Machine. Vertical Unit is equipped with 18-spindle auxiliary head, two opposed horizontal Units with 8-spindle auxiliary heads.*

Installation view of two opposed horizontal BARNESDRIL *Units with In-and-Out-Work table between. Each Unit has two spindles for boring and reaming operations.*



BARNESDRIL Standard Hydraulic Production Units are Adaptable to a Broad Range of Drilling, Reaming and Facing Work

The "special" drilling job, depicted in the three illustrations on this page, is a typical example of how you can obtain higher production, lower cost and almost unlimited flexibility with BARNESDRIL Standard Hydraulic Production Units.

For instance, on the three-unit machine (above left) 26 holes, varying in diameter from $^{19}/_{32}$" to $^{21}/_{64}$", are drilled in a rear axle housing of a 6-ton, 6-wheel drive truck in .8 of a minute, floor-to-floor time. The two-way unit horizontal machine at the right is employed for boring, reaming and chamfering holes (which range from 2.375" to 4.250"), in the same axle housing. Each unit is equipped with a selector for changing the speed from 300 feet for boring to 90 feet for reaming.

BARNESDRIL Hydraulic Units, from which these machines are built, are self-contained and complete in themselves and can be arranged in one or any combination of vertical, horizontal or angular positions. Thus, they incorporate the advantages of strictly special machines and the low initial investment and operating costs of standard machines. Available in three sizes, each motorized according to the job requirements with 5 to 25 hp. motors, BARNESDRIL Standard Units offer substantial savings in machining and handling time as well as nearly unlimited versatility.

BARNESDRIL engineers will be glad to show you how Standard Units can be profitably adapted to your "special" drilling, reaming and facing work. Call on them without obligation.

SEND FOR ADDITIONAL INFORMATION on how you can profitably adapt BARNESDRIL Units to your work. Ask for free copy of Bulletin A-150.

Barnes Drill Co.

830 CHESTNUT STREET
ROCKFORD
ILLINOIS, U. S. A.

OUTPUT UP 20% . . . Rejects, Scrap & Refinishing CUT SHARPLY . . .

LIPE *Pneumatic* BAR FEED

Gives You ALL These Performance Advantages . . .

FAST—saves up to 20 minutes on a 12-foot bar.

EFFICIENT—increases output up to 20%.

AUTOMATIC—feeds instantly to the fixed stop as soon as the collet is opened.

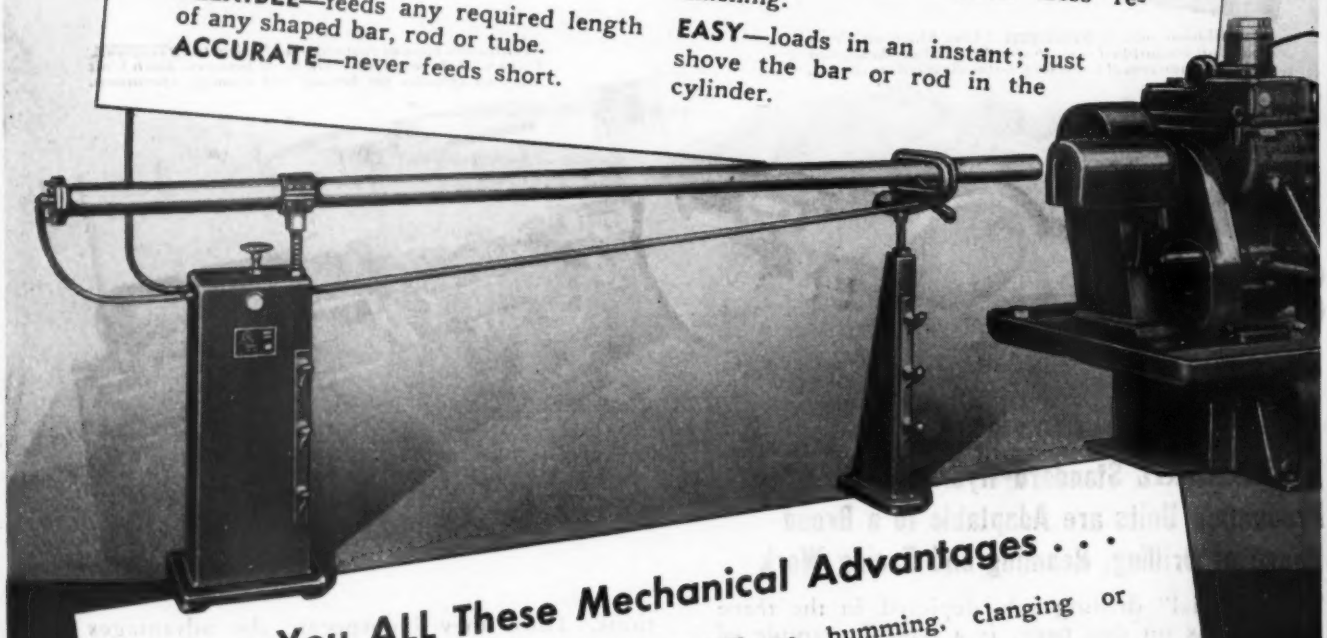
FLEXIBLE—feeds any required length of any shaped bar, rod or tube.

ACCURATE—never feeds short.

THOROUGH—feeds to the least possible remnant. Lowers scrap losses.

ECONOMICAL—handles exact-sized polished stock without marring or scratching. Fewer rejects. Less refinishing.

EASY—loads in an instant; just shove the bar or rod in the cylinder.



Gives You ALL These Mechanical Advantages . . .

SIMPLE—just a low-pressure air cylinder and a piston with a ball-bearing cup center for holding the rod.

COMPLETE—ready to use when you get it, just hook it up to your shop air line.

SAFE—bar is completely enclosed by the cylinder. No whirling or whipping ends to require guards or cause accidents.

FOOL PROOF—feed power cannot be applied unless the cylinder is locked in proper working position.

QUIET—no humming, clanging or banging.

TROUBLE-FREE—eliminates all troublesome feed fingers, collars, ratchets and wobble plates.

LOW COST—pays for itself quickly in the time, materials, re-finishing and accidents it saves.

Available for all hand screw machines up to 2½" diameter capacity, and for automatic screw machines Nos. 00, 0, 2 and 6. Write today for complete information. A nearby Lipe technical representative will call if you wish.

ARMY E NAVY

LIPE-ROLLWAY CORPORATION
SYRACUSE 1, N. Y.

GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING

Tracer Controlled PANTOGRAPH Saves Critical MAN HOURS

IRREGULAR PORTS MILLED in ROTARY VALVES . . . in 30 Min. Each

Typical HIGH PRODUCTION JOB for 1000 HP. Diesel Engines

This manufacturer solved the difficulties involved in milling irregular shapes in cylindrical parts by placing the job on a Gorton Tracer-Controlled Pantograph, equipped with a Gorton Roll Attachment, enabling use of only a simple, FLAT Master.

Specifications called for cutting highly finished ports in these Rotary Valves of nickel steel tubing, 7/32" thick. The required rough, semi-finish and finish cuts were completed in 30 minutes per Valve, Floor-to-Floor Time. Port was first roughed with 3/8" dia. 4-flute spiral end mill. For the semi-finish operation, tracer and cutter were changed to 1/4" dia. Finish cut necessitated only a change in tracer style. To prevent chatter marks and insure the fine finish demanded, only .002" to .003" of stock was removed in the finishing cut.

GORTON ENGINEERING SERVICE, FREE. Submit your milling problems like these to Gorton Engineers. Use their specialized experience in Tracer-Control Milling to solve your problems—recommendations made without charge or obligation. Send part or print and specifications to your nearest Gorton Dealer, or direct to the Gorton Factory at Racine, Wis.

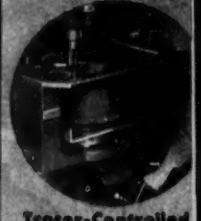
Gorton Tracer-Controlled Machines simplify difficult operations like this, because they are quickly set up, and easily operated with less skilled labor than by other methods. Tracer-Control assures uniform accuracy. The versatile Gorton Roll Attachment permits milling or engraving of continuous designs, completely around rolls, tubes, etc. For further information, send for both Bulletins offered below.

JOB IN BRIEF . . .

PART—Valve.
OPERATION—Milling of irregular-shaped port in Valves.
MACHINE—Gorton 3-Z Pantograph.
ATTACHMENT—Gorton Roll Attachment 750-1.
CUTTERS—3/8" and 1/4" four-flute, spiral, end mills.
MATERIAL—Nickel Steel tubing, 7/32" wall thickness.
PRODUCTION—30 minutes per Valve, floor-to-floor.
FINISH—Exceptionally smooth.

The Right Size The Right Type of Machine for Every Job . . .

From 2 oz. to 2 ton



DIE BLOCKS

Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON ARMY E NAVY

GORTON Precision MACHINES

CUTTER GRINDERS | ETCHING MACHINES | 2 & 3 Dimensional PANTOGRAPHS | Vertical & Universal Head Super-Speed MILLERS | Electrical & Electric Control DUPLICATORS

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George Gorton Machine Co.,
1508 Racine St., Racine, Wis.

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- ☐ Condensed Catalog
- ☐ Pantograph Engraving Machine

Name..... *Title*.....

Company.....

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Hammond
OF KALAMAZOO
ABRASIVE BELT GRINDERS-POLISHERS

Model F-2 Flexible Belt

Hammond offers in its wide line of abrasive belt machines —for either wet or dry operations—the highest standard of machine tool construction for economical, high production grinding and finishing. Write for bulletins.

Model "400" Wet-n-Dri 4" Belts

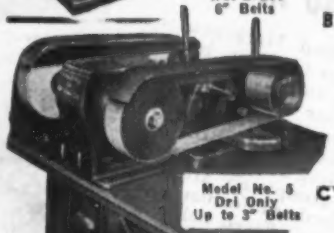
FLEXIBLE BELT UNITS

Inexpensive bench or pedestal type for replacing slow, costly hand finishing methods.

Model VH-6 Wet-n-Dri 6" Belts

GRINDERS—POLISHERS

Whatever your problem —investigate the available Hammond machine for handling it. Both bench and floor type Wet-n-Dri machines for use with abrasive belts from 2" up to 10" widths.



Model No. 5 Dri Only Up to 3" Belts

BACKSTANDS

Bench and floor types to convert polishing equipment into belt finishing units.

CYLINDRICAL FINISHING

For ¼" to 9" outside diameter tubes, rods, bars.

Backstand and POLISHING LATHE UNITS

For faster, better, large volume finishing.

Variable Speed Lathe & Backstand

HAMMOND PRODUCTS — CARBIDE, GENERAL PURPOSE AND ABRASIVE BELT GRINDERS AUTOMATIC AND CYLINDRICAL FINISHERS • POLISHING LATHES

Hammond Machinery Builders

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Eastern Branch: 71 West 23rd Street, New York 10, N. Y.

SIGOURNEY M-100

PRECISION MADE FOR PRECISION RESULTS

The Sigourney M-100 Bench Drilling Machine provides the rigid, accurate construction that means maintained precision over a long service life.

Completely enclosed for operator safety . . . sealed ball bearings throughout . . . hardened and ground spindles . . . standard speed range from 4000 to 10,000 RPM, other ranges available . . . manufactured in models from 1 to 6 spindles.

Send for Illustrated Bulletin

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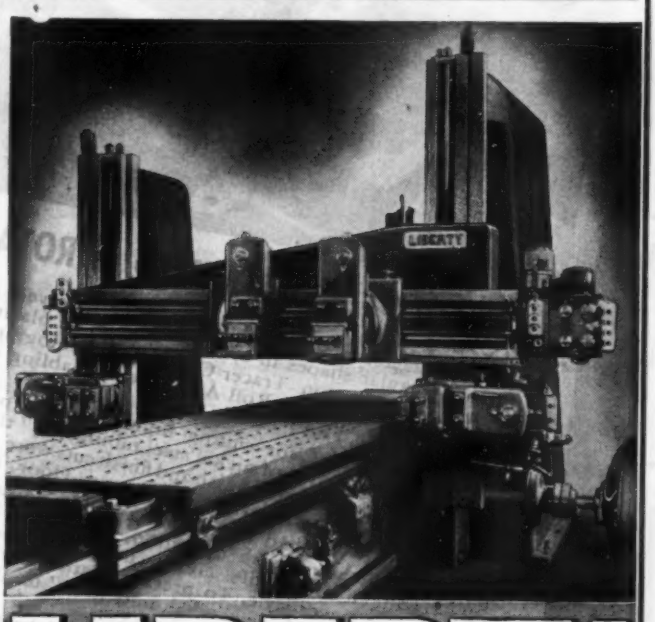

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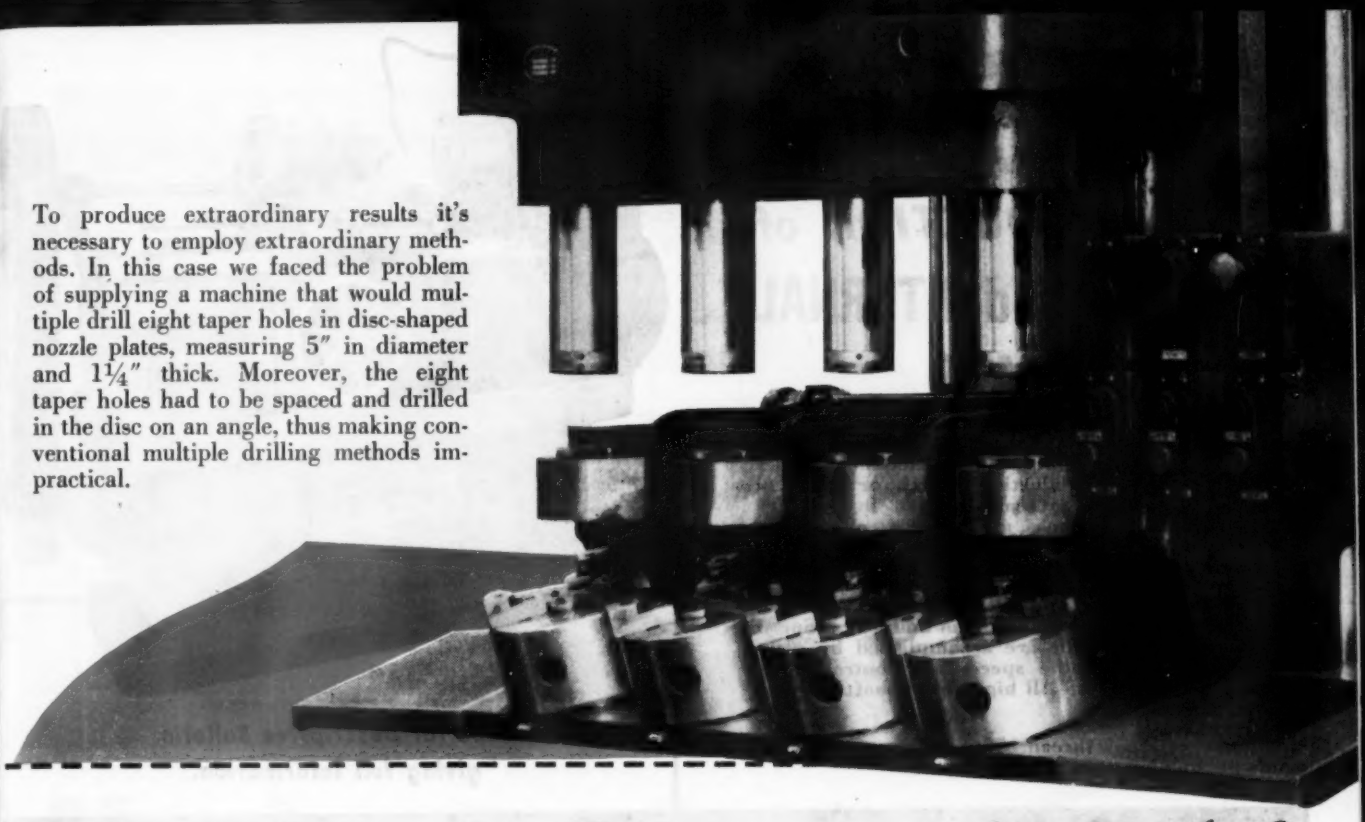
SMALL, MEDIUM AND HEAVY DUTY

PLANERS

FOR HIGH SPEED, LOW COST PRODUCTION

LIBERTY PLANERS • HAMILTON, OHIO, U. S. A.

Over a Quarter Century of Specialized Experience with Time Tested Principles of Design



To produce extraordinary results it's necessary to employ extraordinary methods. In this case we faced the problem of supplying a machine that would multiple drill eight taper holes in disc-shaped nozzle plates, measuring 5" in diameter and 1¼" thick. Moreover, the eight taper holes had to be spaced and drilled in the disc on an angle, thus making conventional multiple drilling methods impractical.

Here's an Unusual Job!

BAKER Engineers worked out a practical solution by equipping BAKER's standard Model 26-HO with

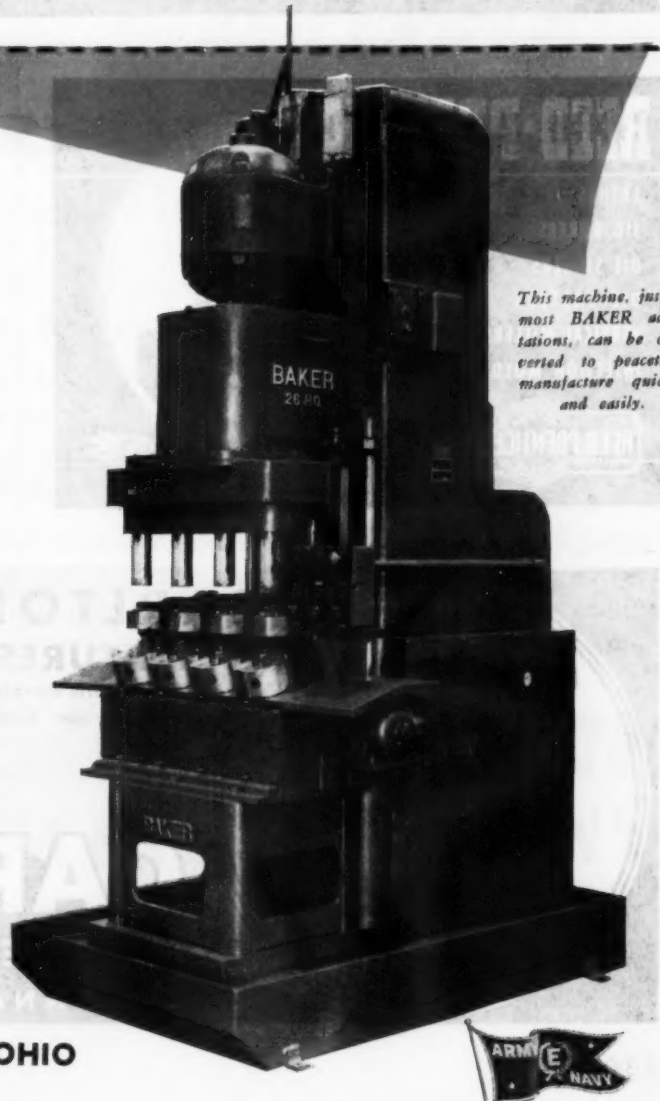
. . . a simplified drive

. . . a fixed center multiple drilling head, featuring four 3-jaw chucks mounted on an angle

. . . four specially ground solid twist drills, taper ground.

The spindles, spaced to drill one hole in each of the four parts at one time, are operated automatically. The operator loads four discs, one in each chuck, touches a push button and the machine starts an automatic cycle that drills the required eight holes in each of the four parts . . . all without further assistance from the operator.

You want equally suitable, efficient solutions to your problems. Your letter to BAKER, describing the product and desired result will bring immediate cooperation —and the answer!



This machine, just as most BAKER adaptations, can be converted to peacetime manufacture quickly and easily.

BAKER Bros., Inc.

ingle and Multiple pindle Machines for rilling, Boring and Tapping

TOLEDO 10, OHIO

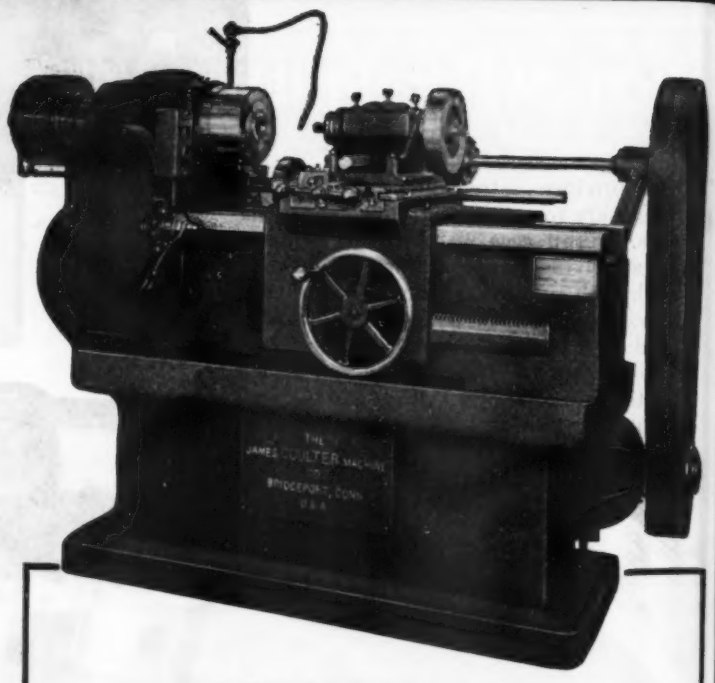
ARMY E NAVY

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

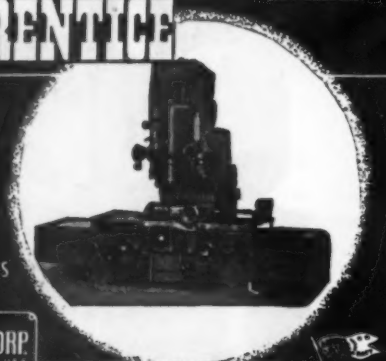


Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT · CONNECTICUT · U.S.A.

REED-PRENTICE

LATHES
JIG BORERS
DIE SINKERS
DIE CASTERS
VERTICAL MILLERS
INJECTION MOLDERS



REED-PRENTICE CORP.
WORCESTER TOOLS MASS U.S.A.

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

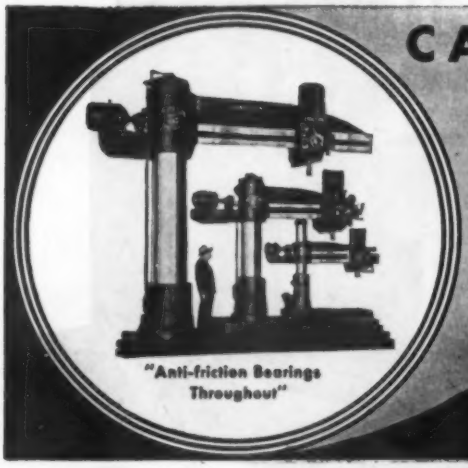
OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio

CARLTON RADIAL DRILL



"Anti-friction Bearings Throughout"

FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

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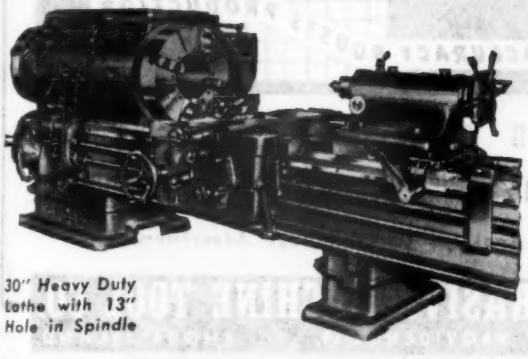
Hydratrol Lathes

LARGE HOLLOW SPINDLE TYPE

TELL THEIR OWN PERFORMANCE STORY!



30" Heavy Duty Lathe with 13" Hole in Spindle

When HYDRATROL LATHES enter the machine tool picture, the story is invariably one of Increased Production, Improved Work, and Lower Costs. Man hours, too, are reduced—a vital factor in this critical labor shortage period.

In a number of big war plants, important operations are being performed in 1/2 to 1/7 the time of previous operations. In one plant, HYDRATROL LATHES are saving 15,000 man hours per month!

Why not let us show you what a HYDRATROL LATHE (Large Hollow Spindle Type), could do in *your* plant? Send us prints for a time-and-money-saving recommendation.

Complete Line of Sizes from 18" to 36"

Small	18" up to 7¼"	Hole
Medium	24" up to 12"	Hole
Large	27" up to 13"	Hole
Large	30" up to 14"	Hole
Large	36" up to 16½"	Hole

(Standard type lathes, 16" to 36")

Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND ★ ST. LOUIS 3, MISSOURI

MOREY TURRET LATHES

for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
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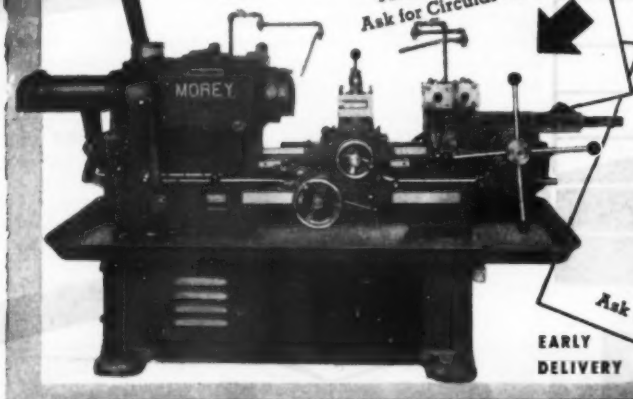
EARLY DELIVERY



INFINITE SPINDLE SPEEDS —Electrically Selected—

DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).

GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.

SPINDLE MOUNTED ON TIMKEN BEARINGS.

RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.

SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

. . . for faster finishing at lower cost

NO. 101 "PRODUCTION"
Centerless Feed Polishing Machine

With this machine, no centering, holding or chucking are required. Work is fed automatically and better, faster finishing assured at low cost. Skilled operators are not required to produce work having a superior finish.
The No. 101 Machine is designed for polishing and buffing cylindrical work and has a capacity for work from ¼" to 6" diameter. It is furnished either for belt drive or for direct connected motor drive.
For taper cylindrical work, we are prepared to furnish a Roll type of centerless feed. This machine can also be furnished in tandem of two or more for multiple finishing.

Descriptive literature is available promptly on request, and gives full information on this machine.

PRODUCTION MACHINE CO.
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

No. IG	INTERNAL GRINDER	**No. 34**	VERTICAL SPINDLE SURFACE GRINDER
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MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPPING Units

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

Can you produce this part... without machining?

ETNA SWAGING UNITS
Can... and do!

Swaging offers you important savings in time, operations involved and amount of material used. Even on involved designs, such as the Swaged part shown here, no metal is cut away and machining operations are virtually eliminated. There's no sacrifice of accuracy with Swaging, rigid tolerances can be held easily.

Drop a note to ETNA today describing your tapering, sizing and reducing problems. We'll send the facts on Swaging and the advantages it offers as applied to your operations.

ETNA Swaging Machines are built in standard sizes with maximum capacities from 3/8" to 6"—die lengths up to 18" for tapering, sizing and reducing of hollow, solid, round or angular parts. Larger sizes are built to order.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

"Ask ETNA about Swaging"

The ETNA Machine Co.

3400 MAPLEWOOD AVENUE

TOLEDO 10, OHIO

If it's a small part, turn it with Precision, Speed and Profit on a

SHELDON LATHE

Model S-56
10" Precision Lathe

All SHELDON lead screws are cut on the finest Pratt and Whitney "Super-precision" lead screw machine

BUILDERS of GOOD LATHES since 1919

Engineered for precision shop and tool room work. Rigidly built to stand up and hold its close accuracy under round-the-clock operation. This is a quality machine tool in every detail, yet is moderate in price . . . a lathe that stands out far ahead of others. (The lathe selected by U.S. Army, the Navy and the Marine Corps, for mechanized machine shops, instrument repair shops, etc.)

Contact us or your local Sheldon dealer for prices, engineering data, deliveries, etc.

- Heavy Bronze bearings
- 1" Collet capacity
- 11¼-inch swing
- Double-walled apron
- Large hardened and ground spindle
- Extreme accuracy
- Convenient controls
- Underneath V-belt motor drive
- All Steel Bench

SHELDON MACHINE CO., INC., 4234 N. KNOX AVE., CHICAGO 41, U. S. A.

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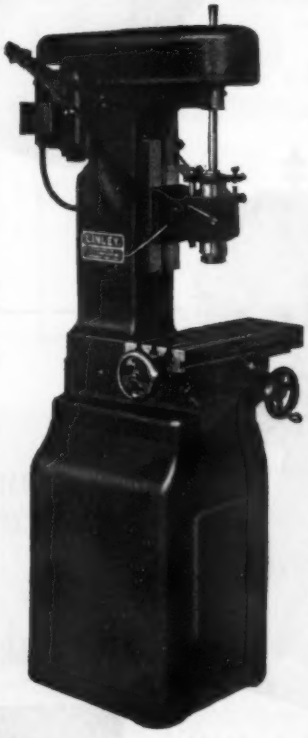
HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

CONFUSION ENDS . . .

when a "LINLEY" GOES TO WORK



You've seen jobs pile up . . . little, fussy milling and jig boring jobs . . . until things looked hopeless. Dies, models, metal patterns, jigs, reaming, drilling . . . all needed at once. Have you put them on expensive high rated machines to catch up? Have you squandered valuable toolmakers' time that way?

The LINLEY is your solution. It's a regular "beaver" . . . working at any of its 8 speeds (to 4250 r.p.m.) to bring order out of confusion . . . to give you generous profits on little jobs. All in 2½ sq. ft. of floor space . . . a sturdy, accurate unit that pays its way from the start.

Bulletin on request.

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
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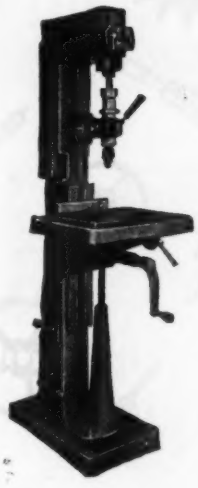
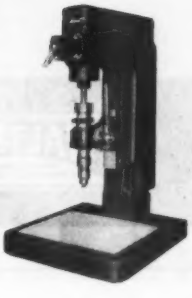
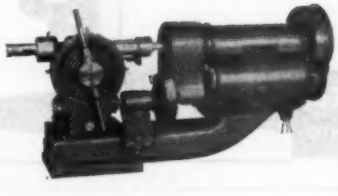
A HIGHLY DEVELOPED LINE...

Avey





MA 8—Eight speeds. 1200 to 12,000 R.P.M. Small work up to ⅜". Built-in motor. Bench and column types. 1 to 6 spindles.



Type B—No. 1, No. 2, No. 3 sizes. Hand feed drilling units. Hand feed tapping units. Power feed drilling units.

ONLY years of steady development can evolve the drilling equipment that is found in the Avey Line of Sensitive Drilling Machines.

The advances required in machining methods caused by the demands for greater output, necessitated more efficient drilling equipment. Avey Drilling Machines have steadily led the field.

Avey High Speed Sensitive Drilling Machines are built-in types and sizes to cope with varied needs. They are designed in capacities from the smallest drill gauge size to approximately 1¼ inches.

Being ball bearing throughout, they rate the highest speeds without vibration. This feature insures maintained accuracy.

The Avey Catolog details the line of Avey Drilling Machines and Drilling Machine Accessories.

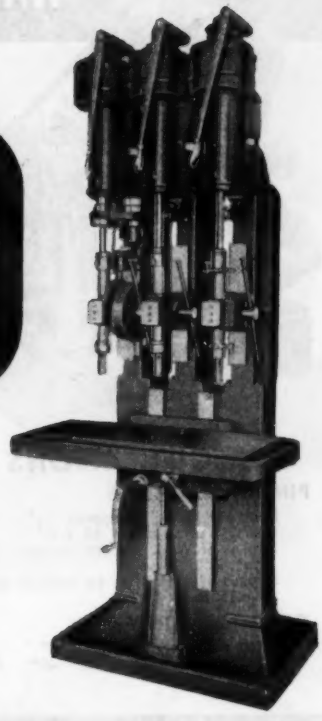
Avey Engineers will come to your aid in solving new and different drilling problems.

•

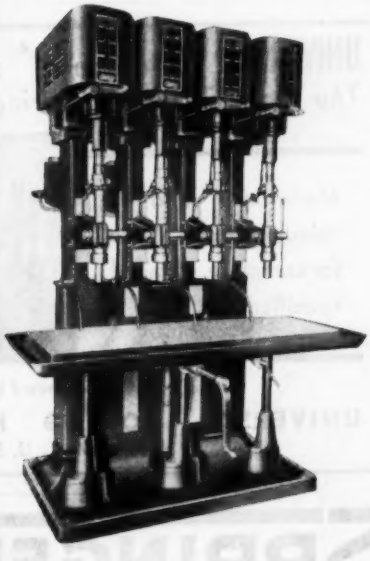
Individual Motors for each Spindle.

Single and Multiple Spindles.

AVEY
DRILLING MACHINE CO.
CINCINNATI · OHIO



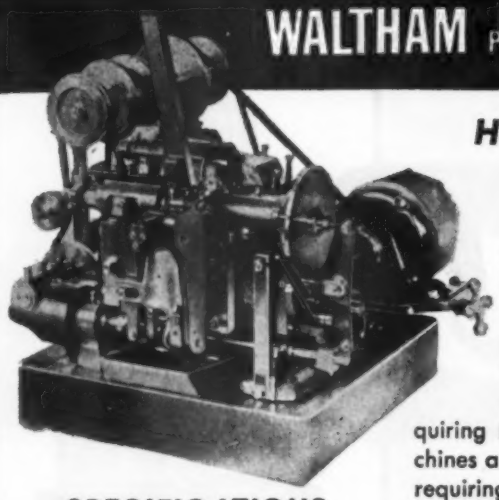
MA 6—Six speeds. No. 2 and No. 3 sizes. Built-in motors.



Belted quick speed change machine. No. 2 size. Four speeds. Standard frame motors.

Avey DRILLING MACHINES
CINCINNATI · OHIO

WALTHAM PINION & GEAR CUTTING MACHINES

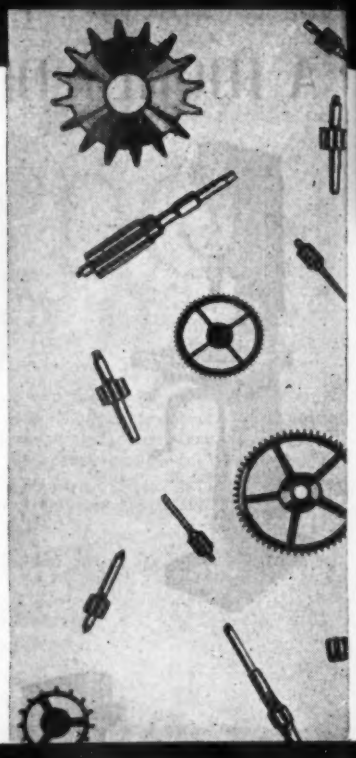


Highly productive—fast and accurate

These machines—made in single-cut, multiple-cut and magazine-feed types—are designed for the fast, precision production of gears and pinions for watches, instruments, fuses, etc. They are simple to operate, requiring no special skill. Magazine-feed machines are fully automatic, the other machines requiring positioning of blank and starting by hand.

Drive for these machines is either from countershaft or by individual motor. On motor driven machines, V-belts drive cutter spindle, worm shaft and pump.

Illustrated literature and detailed specifications are available promptly on request.



SPECIFICATIONS

PINION MACHINES

Diameter capacity, approx. ½"
Coarsest pitch about 32 D.P.
Strokes of Work slide for pinions—.24" to .45"
Strokes of work slide for stacked gears —.85 to 1"

GEAR MACHINES

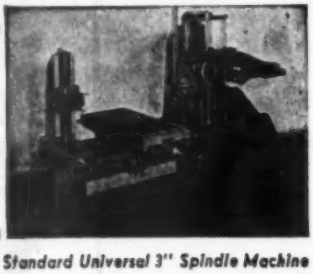
Pitch diameter, capacity 1½"
Strokes for work slide, .40", .65", 1.00", 1.25"

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

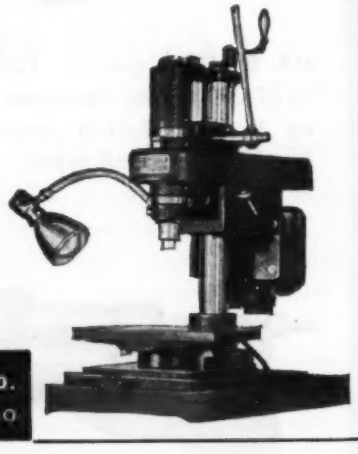
Precision-Built
For Precision Drilling

HAMILTON "VARIMATIC"

for small holes
.004" to 5/16" dia.

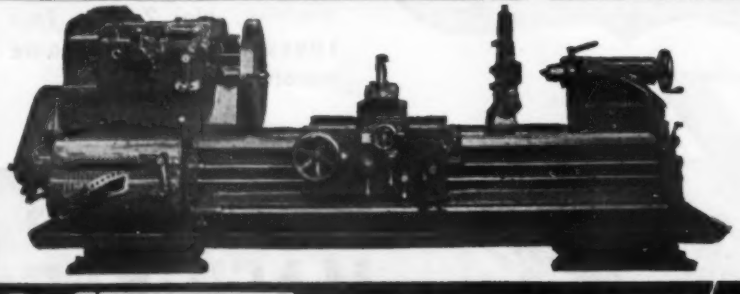
A super-sensitive drilling machine of uncanny precision and radical departure in design to achieve an infinitely variable range of speed, sensitivity, ease of operation and all-'round performance. Speed ranges from 840 to 9300 r.p.m.

Write for new bulletin



The Hamilton Tool Co.
HAMILTON OHIO

SPRINGFIELD GEARED HEAD LATHES

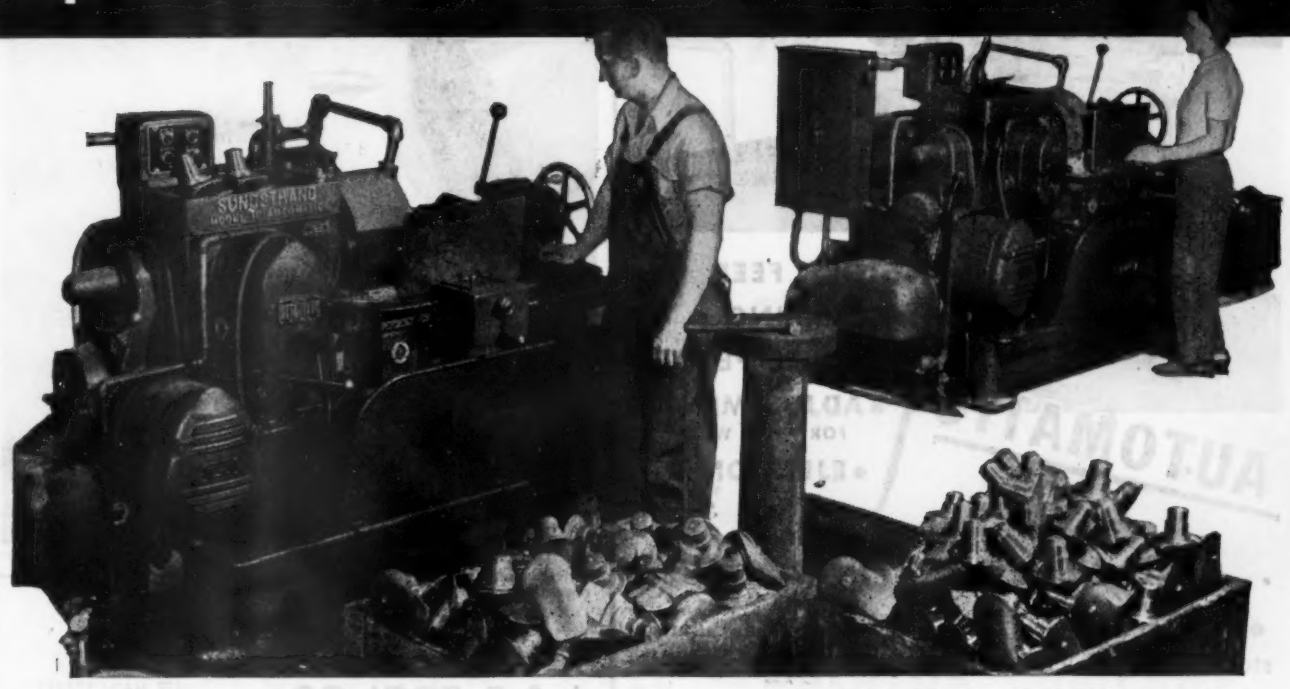


for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes—flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

How to "Multiple Tool" Your Turning Operations for Greater Production



PRODUCTION INCREASED OVER *10 times* ON RUN OF *400 pieces*

● Here's an excellent example of how Sundstrand automatic lathes can be tooled to increase production over other turning equipment. This frame arm was formerly turned at the rate of four pieces per hour. Dividing the job into three operations, increased the production over ten times. Tungsten carbide tipped cutting tools are used for maximum metal removal. The quick cycle changeover feature of Sundstrand lathes makes it possible to process many other parts over these three machines at even greater savings in machining time.

3 SUNDSTRAND LATHES REPLACE *10* MACHINES

● More than ten of the type turning machines previously used would be required to produce the same amount of work produced by these three Sundstrand automatic lathes. In addition to this profitable increase in production, the customer finds they can secure accurately duplicated parts consistently. Further, the operator's duties are simplified due to the automatic machine cycle.

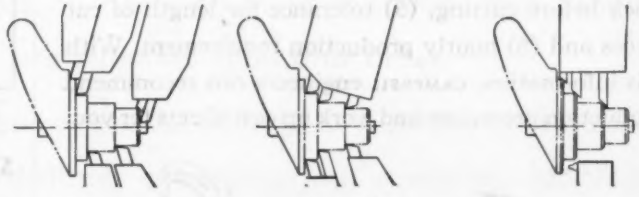
PROCESSING DATA

● Actual tooling of the job is shown below. Tooling diagrams illustrate how the complete job is divided into three separate operations.

OP. No. 1 • Rough turn, rough face and chamfer.
• Production—51 pieces per hour at 85% efficiency.

OP. No. 2 • Finish turn and finish face.
• Production—46 pieces per hour at 85% efficiency.

OP. No. 3 • Form ball race, groove and chamfer.
• Production—102 pieces per hour at 85% efficiency.



OP. No. 1 OP. No. 2 OP. No. 3

Free GUIDE TO FASTER TURNING OF BOTH LONG AND SHORT RUN WORK

● This 44 page booklet shows how Sundstrand engineered production has been successfully applied to modern turning problems. Both long and short run turning jobs are included with factual tooling and production information taken directly from the field. Write for your copy today. Ask for bulletin 139.

ARMY E NAVY

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

SUNDSTRAND

MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U. S. A.

RIGIDMILLS • AUTOMATIC LATHES • SPECIAL MILLING AND TURNING MACHINES

AUTOMATIC

- STOCK FEED
- CLAMPING
- WHEEL FEED
- ADJUSTMENT FOR WHEEL WEAR
- EJECTION

...AND HERE'S A TYPICAL JOB

● To finish cut rollers for bearings from 52/100 bar stock to close tolerances. Former method required grinding ends. With this new Model 700 AUTOCUTTER the job is done automatically, one operator running a number of machines. No grinding is necessary.

This line of fully automatic abrasive cutting machines is the solution to many problems of production cutting of short pieces with finished ends and to close tolerances. Model 700 cuts up to ¾" stock—Model 725 up to 2½".

IF YOU HAVE A CUTTING PROBLEM

Write and tell us (1) the range of sizes, (2) kind of material, (3) length of cutoff pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information, CAMPBELL engineers can recommend production procedure and work up cost sheets for you.

Campbell

ABRASIVE CUTTING MACHINES

ACCO

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

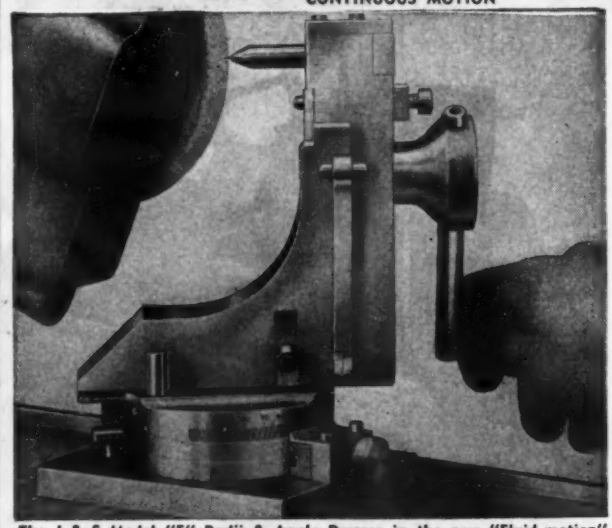
ANDREW C. CAMPBELL DIVISION
AMERICAN CHAIN & CABLE
BRIDGEPORT, CONN.

TRADE MARK

USE *Fluid-motion*

for modern form-dressing

ONE SETTING HANDLE CONTINUOUS MOTION



The J & S Model "E" Radii & Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.

FEATURES

Fluid-motion dressing.
.0001" accuracy.
Automatic centering.
Chatterless and dustproof.
14" wheel capacity.
Versatile and adaptable.

J. & S. TOOL CO.

477 MAIN STREET
EAST ORANGE 1, N. J.

KNIGHT VERSATILE MILLERS ACCURATE RIGID

FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE

W. B. KNIGHT MACHINERY CO.
ST. LOUIS MISSOURI

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

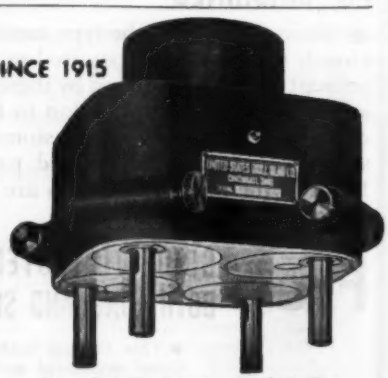
Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

STANDARD US HEADS SINCE 1915

All Types of Fixed Center

DRILLING TAPPING & BORING HEADS



Four Spindle Head. All Spindles Adjustable for equally spaced holes.

FIVE TYPES, 56 SIZES, ADJUSTABLE DRILL HEADS

UNITED STATES DRILL HEAD CO., CINCINNATI 4, OHIO

THESE *Small, Precision* PARTS

Are Being Produced at

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY ON WICKMAN SWISS TYPE AUTOMATICS

MINNEAPOLIS-HONEYWELL is another of America's leading industrial concerns using Wickman Automatics. These machines are in operation in both the Minneapolis and Chicago plants as well as at the company's Brown Instrument Company division.

All of the parts illustrated are produced complete without second operation on the Wickman No. 2. Diameters on almost all parts are held to .0005" and produced with an extremely fine finish. Materials are stainless steel and brass.

The No. 2 Wickman Automatic is shown above equipped with the three spindle attachment used to perform centering, drilling, counterboring, reaming, tapping or threading operations simultaneously with the machine operation. This machine has a 1/2" capacity. A similar Wickman machine is the No. 1 with 5/32" capacity and is available for smaller work of even greater accuracy. Completely descriptive bulletins on both machines are yours for the asking.

THE Wickman CORPORATION

15530 WOODROW WILSON AVE., DETROIT 3, MICH.

A. C. Wickman (Canada), Ltd. P. O. Box 9, Station N, Toronto, Ontario

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SINCE 1905

VICTOR SAW WORKS, INC.— has concentrated its efforts on the exclusive production of metal cutting blades of the highest quality. That is why VICTOR enjoys wide acceptance in industrial plants by expert mechanics for cutting aluminum, brass, copper, steel and alloys and other materials.

TOMORROW'S VICTOR will be the best buy too because VICTOR HACK SAW BLADES will always be produced to cut metal faster and that means you'll be hours ahead if you stay with VICTOR.

AFTER VJ DAY

VICTOR

VICTOR SAW WORKS, INC., Middletown, N. Y.
MAKERS OF HAND AND POWER HACK SAW BLADES, FRAMES AND METAL CUTTING BAND SAW BLADES.

CRITERION *Boring* HEADS

ADAPTABLE

On Criterion Boring Heads shanks are interchangeable enabling operator to use head on different machines. Ideal for slide boring tool holder on small turret lathes. Smooth, compact, rigid. Lead Screw ground from solid AFTER hardening. Sold throughout the U.S. Order from your dealer. Request free literature.

CRITERION
MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

Fastermatic 1FU Automatic Turret Lathe machining gear blank.

Fastermatic Permits 6 Feed Changes and 2 Speed Changes to Turn...Face...Form ...Generate Intricate Bronze Gear Blank

● Production runs on this intricate Ampco Bronze gear blank are handled faster, more economically and with less effort on the Fastermatic Automatic Turret Lathe. Nineteen machining cuts are made automatically with 14 cutting tools averaging less than 11 seconds per cut. All turned, faced, formed and generated surfaces in the first chucking are held to close tolerances to assure correct overall and thickness dimensions for operations in the second chucking.

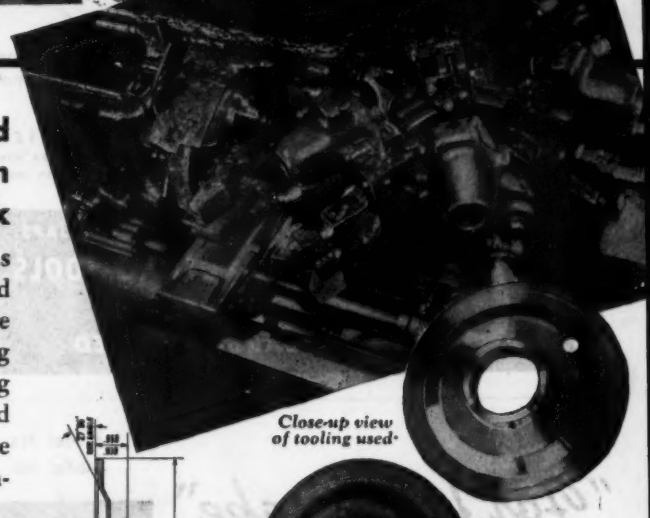
Machining Cycle Completely Automatic

Six feeds and two speeds are used in the machining cycle —all automatically controlled through hydraulic actuation. The operator performs only two manual functions—loading and starting the machine and unloading. As a result, in many cases one person can operate two machines.

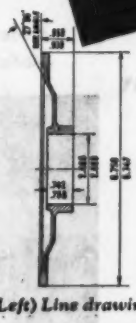
Feeding movements for each face of the turret are predetermined and standard cams mounted on a cam drum control the rate of feed. Infinite feed variations are available. Operating speeds are controlled by hydraulically operated clutches actuated by buttons set on a master spool. This arrangement provides speed changes for each turret face and each operation.

Fastermatic For Your Work

Now is the time to review chucking work you may be handling on manually operated turret lathes to analyze the increased production, greater economy, higher accuracy and finish, which can be obtained on the Fastermatic. Foster engineers will glady assist you in solving difficult machining problems through the use of standard Fastermatic Automatic Turret Lathes.



Close-up view of tooling used.



Gear Blank before and after machining.

(Left) Line drawing of gear blank indicating the machine cuts made

PRODUCTION FACTS ABOUT THIS GEAR BLANK

Machine—Fastermatic Model 1FU.
Part—Spur Gear Blank.
Material—Special Bronze Alloy.
Holding Method—Air operated expanding arbor.
Speeds—1st, 2nd, 4th, 5th, and 6th positions—685 R.P.M.
3rd position—372 R.P.M.
Feeds—1st position—.0029" 2nd—.0034"; 3rd—.0039";
4th—.0026"; 5th—.0023"; 6th—.0025".
Machining Time—3.26 minutes.
Indexing Time—60 seconds.
Loading and Unloading—60 seconds.
Floor-to-Floor Time—5 minutes, 26 seconds.

NOTE: A 27° 56′ angle is generated on both sides of the gear blank and is held to .005" or less in thickness and finished to required concentricity.

FREE...Field Performance Data

Learn how you can solve difficult chucking machine problems. Production Data lists actual field cases . . . shows how time and money were saved by the use of Fastermatic...suggests how you can do the same. Write to Foster Division. 1100 Beardsley Ave., Elkhart, Indiana for your copy.

INTERNATIONAL MACHINE TOOLS

Foster Division - Elkhart, Indiana

INTERNATIONAL DETROLA CORPORATION

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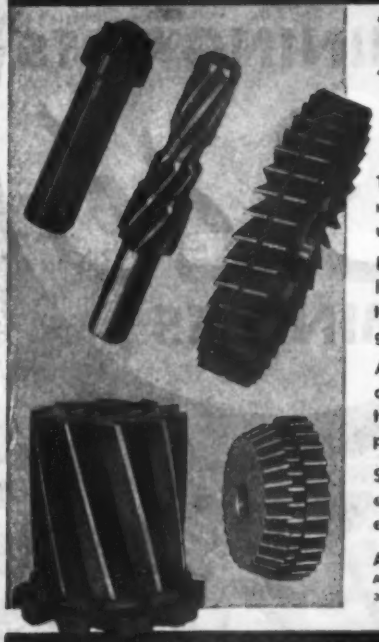
FOSTER FASTERMATICS • LIBBY HEAVY DUTY TURRET LATHES • STANDARD TOOLS

PRECISION TOOLING



To Beat the Japs or Solve Your Postwar Problems

The Pacific war is still making heavy demands upon all of us.

But you, undoubtedly, are looking forward to resuming the production of civilian goods.

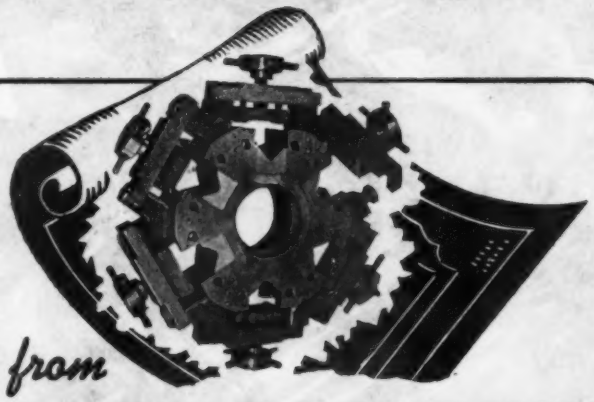
And we are ready to bring our war-won experience to your postwar tooling problems.

Send your inquiries to our engineering Dept. for prompt estimates.

AMERICAN CUTTER
AND ENGINEERING CORPORATION
31741 MOUND ROAD WARREN, MICH

BUY MORE WAR BONDS—HELP CUT DOWN THE JAPS

A.C.E. SPECIAL CUTTING TOOLS
HI-SPEED OR CARBIDE-TIPPED



from

BLUEPRINT TO FINISHED TOOL

From a problem submitted by a customer our engineers and tool designers created the above machine tool—as example of the ingenuity and thoroughness of our Company. This service is yours. Write or call for complete information.

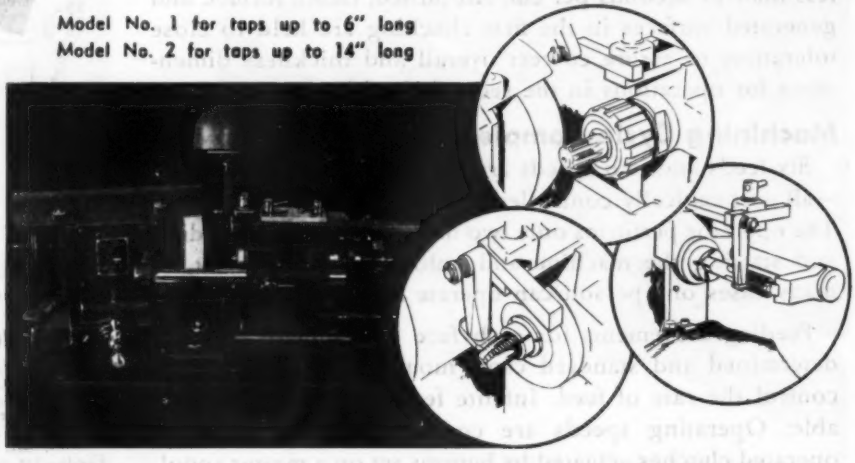
JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES

COLUMBUS DIE·TOOL and Machine Co.
935 CLEVELAND AVE.,
COLUMBUS 1 OHIO
ESTABLISHED 1906

"For lands sake"

KEEP TAPS SHARP ON A BLAKE TAP GRINDER

Model No. 1 for taps up to 6" long
Model No. 2 for taps up to 14" long



When you purchase taps, you expect and get specified tolerances on every part. But, when these taps must be resharpened, do you repeat this *original* accuracy every time? When you sharpen the chamfer on a Blake Tap Grinder, you can be sure of maintaining *original* accuracy throughout the life of every tap. This means an increase in accurately tapped holes, and a decrease in broken taps and scrapped work.

For lands sake, sharpen taps (either left- or right-hand) with 2, 3, 4, 5, 6, 8, and 10 flutes on a Blake Tap Grinder. The Blake is also ideal for sharpening countersinks and other tools requiring relief at the point.

No machine is better than the cutting edge of the tool it uses.

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

Please send me Bulletin No. 544 which describes the Blake Tap Grinder in detail.
A.M.

Name..... Title.....
Company.....
Street.....
City..... State.....

You Can Do a Wide Range of Work With This Wade MOTOR DRIVEN BENCH PROFILER

FOR SMALL PROFILING, MILLING, SLOTTING, RECESSING AND ROUTING OPERATIONS

SPECIFICATIONS

Working area:
2" x 4" horizontal, 1¼" vertical
Fixture block: 4" x 4" x ½"
Work surface of table: 4¼" x 4"
Travel of vertical slide: 1¼"
Travel of table: 4½"
Travel of cross slide: 2"
Cutting tool collet: Any standard size up to 5/16" dia. Standard ¼" collet supplied unless otherwise specified.
Distance of table to nose of spindle, when down: 2¾"
Center distance, cutter spindle to follower: Approx. 2-1/16"
Follower cutter spindle: No. 2 B&S taper
Motor: Standard ¼ h.p., 3-phase
Speeds: Four speeds ranging from 1000 to 8000 RPM
Dimensions: 19" wide, 24" long, 22" high.
Weight: Net, 260 lbs., boxed, 285 lbs.

Wade

Bench Lathes and Profilers For Precision, Versatility And Stamina

You can do a wide range of precision work with this Wade Motor Driven Bench Profiler . . . work such as profiling, milling, slotting, recessing and routing operations . . . on a variety of small parts such as watch and clock plates, clock mechanisms, mechanical time fuses, parts for small firearms, range finder parts, typewriter and adding machine parts, etc.

It is a precision built profiler for production work. Women and unskilled help can quickly become expert in its operation and turn out duplicate precision work within exceedingly close tolerances.

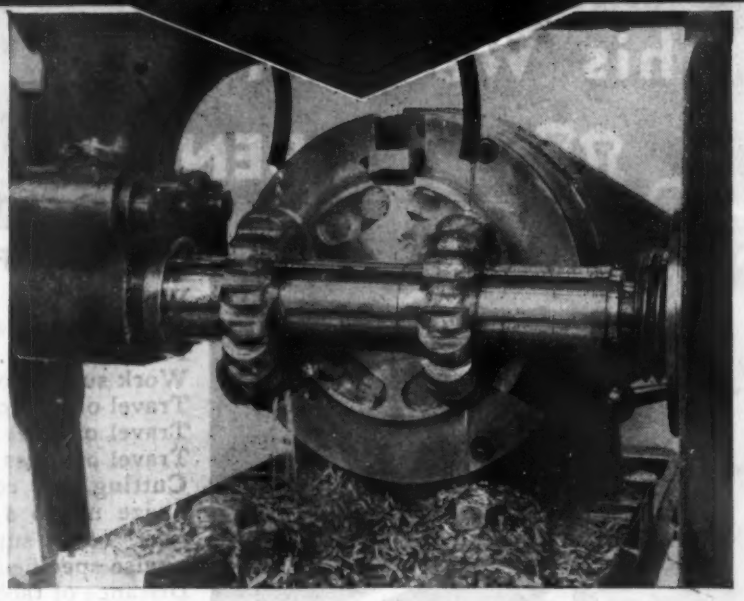
The Wade Bench Profiler is a time and money saver . . . a small, moderately priced machine tool that will pay for itself over and over in your production line.

Write today for catalog

THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS

THIS MILLING OPERATION IS CONVENIENTLY HANDLED WITH THE HARTFORD SUPER-SPACER



By mounting a quick clamping fixture on a Super-Spacer base, a difficult rough milling operation on an aircraft engine part is handled with ease. Fixture is operated by a hand wheel at the back.

Illustrated literature describing the Super-Spacer and showing many of its everyday uses will be sent promptly on request. *Write today for full information.*

Convenience in handling this rough milling operation is made possible through a special base attached to the Super-Spacer body. Indexing is handled in the usual way, with mask plates eliminating all chance of error.

Rigid control of spacing operations of all kinds is offered through the use of the Hartford Super-Spacer, accuracy is maintained and fast work assured. The extent to which the Super-Spacer may be used to advantage is almost unlimited and suggests your making a prompt investigation of its possibilities on your work.

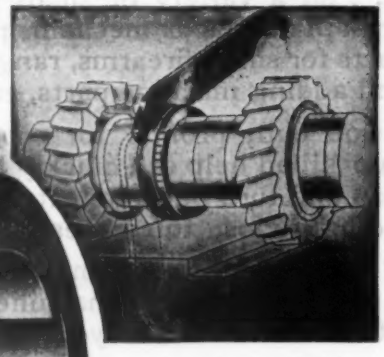
The HARTFORD SPECIAL MACHINERY CO. Hartford 5, Conn.

SAVE TIME ON YOUR GANG MILLING SET-UPS

You are assured FAST—ACCURATE spacing on all side milling cutters and gang milling set-ups with

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

Just loosen cutter arbor nut and make plus or minus adjustment with handy wrench as shown.



"DAYTON ROGERS" ADJUSTABLE SPACING COLLARS are graduated in thousandths, with plus or minus markings as illustrated. A .0005 adjustment can easily be made by visual calibration. These collars are made in 12 standard sizes from ⅜" to 2".

Write for illustrated bulletin #120-1

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Almond Drill Chuck

. . for over 70 years

ALMOND THREE-JAW DRILL CHUCKS—the first to be placed on the market more than seventy years ago—pioneered the field of drill chucks. During all these many years, ALMOND CHUCKS have continued to be a necessary part in the logical procedure of machine developments.

Made in types and sizes to fit all machine tools and portable drills.

Write for further information.

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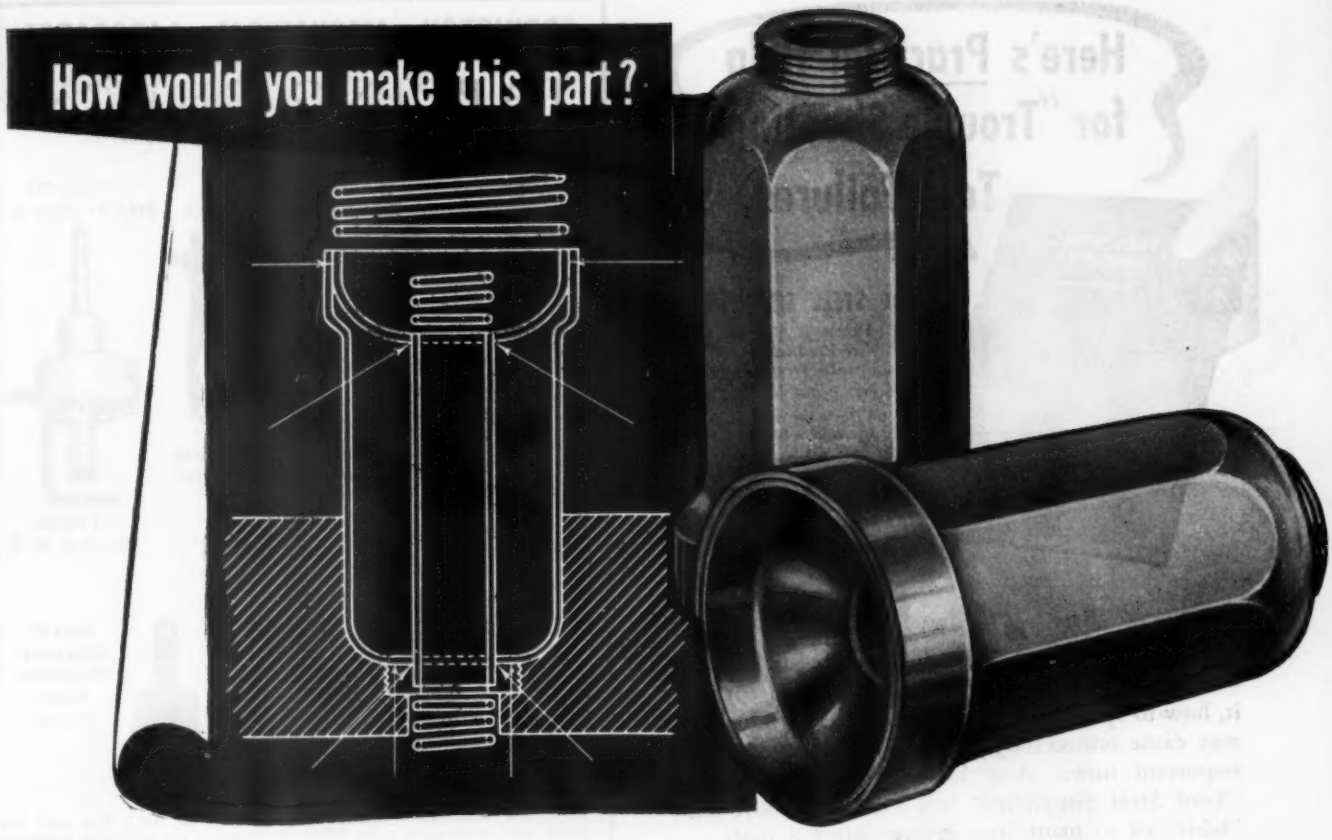

Lepel Induction Heating makes "child's play" of many tough jobs

Here's another example of the manner in which Lepel Induction heating simplifies and speeds difficult assembly jobs.

The assembly consists of two steel stampings, a section of seamless tubing and a part machined from brass bar stock.

Surfaces to be joined are pre-fluxed and the parts assembled in a jig with the brazing alloy or solder preplaced in the form of rings. Heat is applied simultaneously to all joints, indicated by arrows on blueprint, by means of special load coils of the Lepel Induction Heating Unit. The operation requires but a few seconds and production can be further accelerated by set-ups which make it possible to braze or solder several units while others are being assembled.

As the heat is generated *within the metal itself*, the brazing alloy or solder penetrates throughout the joint, insuring uniform soundness and strength with minimum use of brazing alloy.

Excessive heating is impossible because time and temperature cycles are automatically controlled. There is no scaling; discoloration is minimized; finishing requirements are negligible.

Metals of any analysis — ferrous or non-ferrous — and in any form, can be joined by Lepel Induction Heating, using brazing alloys of any melting point. No special operating skill is required, yet production is speeded and costs are cut.

The same compact, relatively-inexpensive unit can be used without alteration for localized hardening, normalizing, annealing, stress relieving or melting.

Why not permit a Lepel field engineer to check your production for possible economies by this modern heating method. Just write

Lepel
INDUCTION HEATING UNITS

LEPEL HIGH FREQUENCY LABORATORIES, INC.

PIONEERS IN INDUCTION HEATING

***General Offices:* 39 West 60th Street, New York 23, N. Y.**

DO IT FASTER, BETTER, MORE ECONOMICALLY BY LEPEL INDUCTION HEATING

Here's Practical Help for "Trouble Shooting" Tool Failures

TOOL STEEL SIMPLIFIED

By FRANK R. PALMER
Vice-President of
The Carpenter Steel Company
315 *Pages* 205 *Illustrations*
$1.00 *Postpaid in U.S.A.*
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Being able to "trouble shoot" tool failures—knowing how to find what's wrong and correct it, how to spot tools that might *look* all right, but may cause unnecessary shutdowns—is particularly important now. And that is one reason why "Tool Steel Simplified" has become almost the "bible" of so many men responsible for tools.

This down-to-earth, *practical* handbook goes into the subject of "trouble shooting" in a way that you can put to work right in your own shop or tool room. Tells in plain shop language such useful things as how to stop spalling in service, how to avoid heat checks, how to correct soft spots, hardening cracks, size change.

And "trouble shooting" is only one of many subjects covered by "Tool Steel Simplified". It contains usable, helpful information on every phase of tool and die making—tool steel selection, heat treating, furnace atmospheres, quenching, etc.

You can really *use* the information in "Tool Steel Simplified" to help you get better, longer-running tools—as thousands of other tool men are now doing. The book is available *at cost*, $1.00 per copy in the U. S. A. ($3.50 elsewhere). Order as many copies as you need now.

MAIL TODAY

THE CARPENTER STEEL COMPANY
Reading, Pa. Dept. 1-E

Please send me postpaid a copy of "Tool Steel Simplified." I enclose $1.00 ($3.50 *outside the U. S. A.) in full payment for the book.*

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Firm Name_____
(Please Print)

Mailing Address_____

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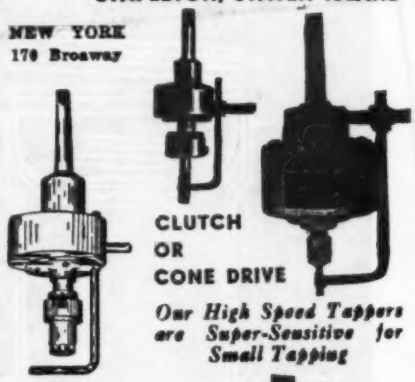

CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

Friction No. O O C. S.

Positive No. O O H. S.

Style B Positive Stop Holds Work Down

Style C Graduated Adjustable Safety Friction

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Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tap-holder. If required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

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IMMEDIATE DELIVERY FROM STOCK

The *Precision* name on a collet is your unconditional guarantee of accuracy in machining, hardening and grinding. Make sure then to specify *Precision* when ordering from your dealer. Literature on request.

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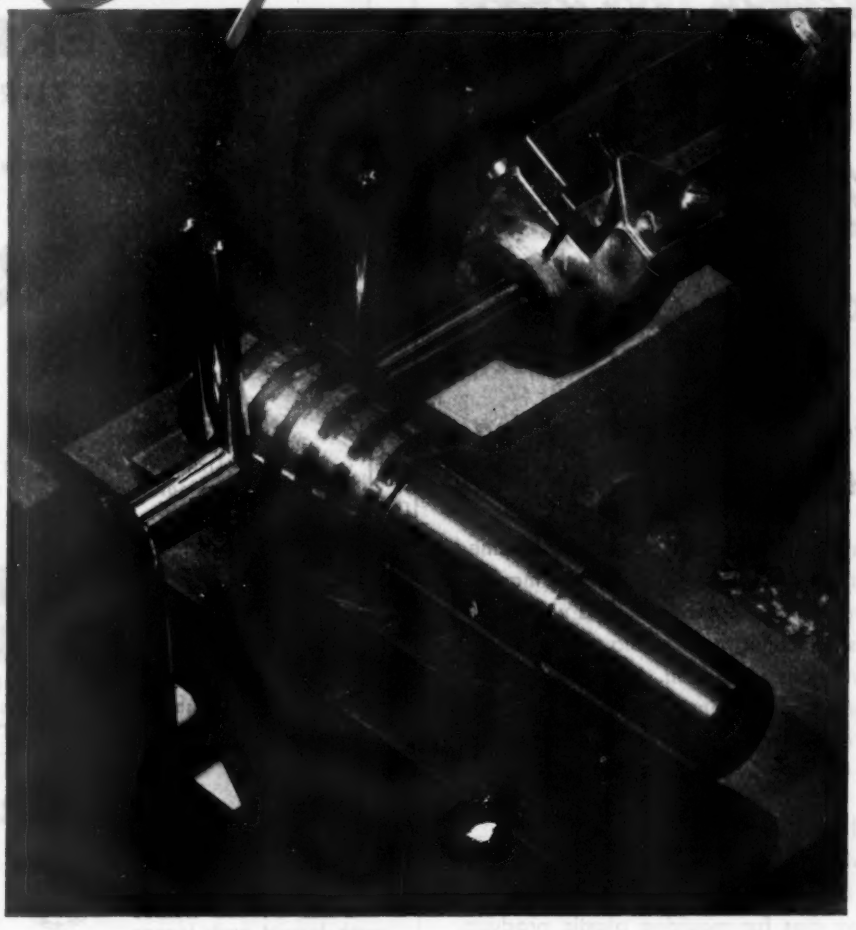

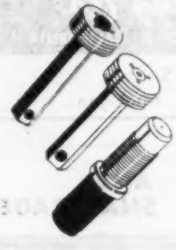

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To help you with your reconversion work, Kobe gage engineers are ready to contribute their full skill and experience. They have worked out many difficult assignments for the Armed Forces, assignments which applied the use of special gages in speeding manufacture and in producing weapons of infinite accuracy

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The broad experience of the Kobe gage engineers along with the complete facilities of the Kobe laboratories can be at your service. A letter to the Kobe Gage Division, stating your problem, will bring a prompt response.

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Wm. Jessop's HIGH CARBON HIGH CHROME ALLOY "C" TOOL and DIE STEEL . . .

Non-Abrasive—Non-Deforming High Production

Made from same base materials as the world-famed Carbon Tool Steels. It can be annealed to machine more readily than High Speed Steel and will take a high finish. Resists scaling on heating and corrosion under moist conditions. This Wm. Jessop steel is air- and oil-hardening and hardens to great depth, retaining cutting hardness after several grinds. It has no peer among so-called non-abrasive steels.

Alloy "C" Steel is admirably suited for all classes of blanking, drawing and trimming dies and punches. It is specially recommended for the hobbing tools used for making dies for moulded plastic products.

Full details on recommended heat treatment available on request.

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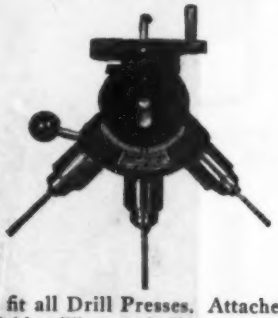

100% Rigid and Accurate

Models to fit all Drill Presses. Attached and removed quickly. Three spindle operations on one spindle Drill Press. See your Dealer — write or wire today for specifications and prices.

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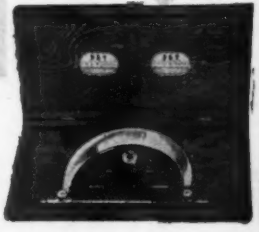
There are a variety of types available with either micrometer heads or dial indicators to cover a range of capacities from 0 to 168 in. . . *Write for Bulletin 200* or outline your gaging problems.



• D & T Bow Micrometer 0 to 6 in. capacity

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Mfrs. of Machine Tools and Micrometers

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NICHOLSON E-X-P-A-N-D-I-N-G MANDRELS ARE

Time-Tested "Time Savers"

Set of 19 of these economy, precision tools does the work of 193 solid arbors. Hardened tool steel. Two types, all sizes. Sold singly or in sets. Prompt delivery. *Bulletin 1043.*

Other Products: Steam Traps, Control Valves, Arbor Presses, etc.

W. H. NICHOLSON & CO., 114 Oregon St., Wilkes-Barre, Pa.

Often *the answer* to YOUR *parallel-surfacing* problems!

GARDNER *Double* DISC GRINDERS

give you high production, close accuracies, on dozens of parallel-surface jobs. Available in many sizes, ranging from the small 12" model shown below, to huge 53" units, they often provide the ideal solution to your problems.

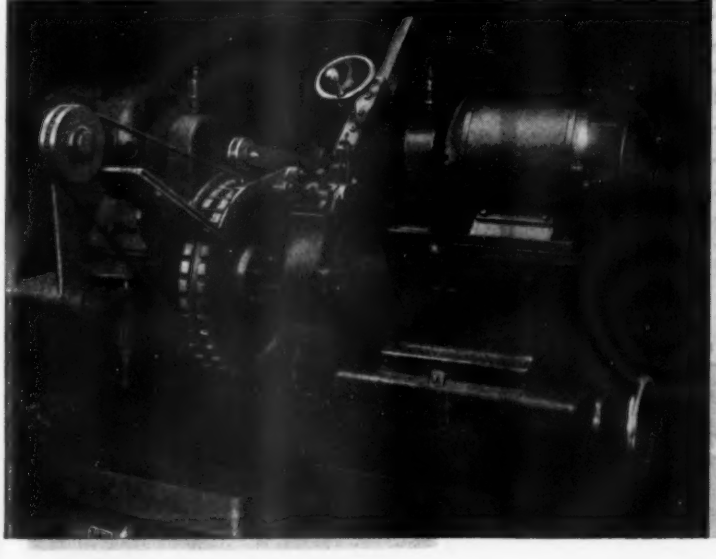
While the job which we illustrate here is not one requiring a precision machine, the larger sizes of Gardner Double Grinders can be built as true PRECISION units. Such tools are in use in every ball and roller bearing plant, for example, producing races and rolls within a few ten-thousandths, and at high rates of production.

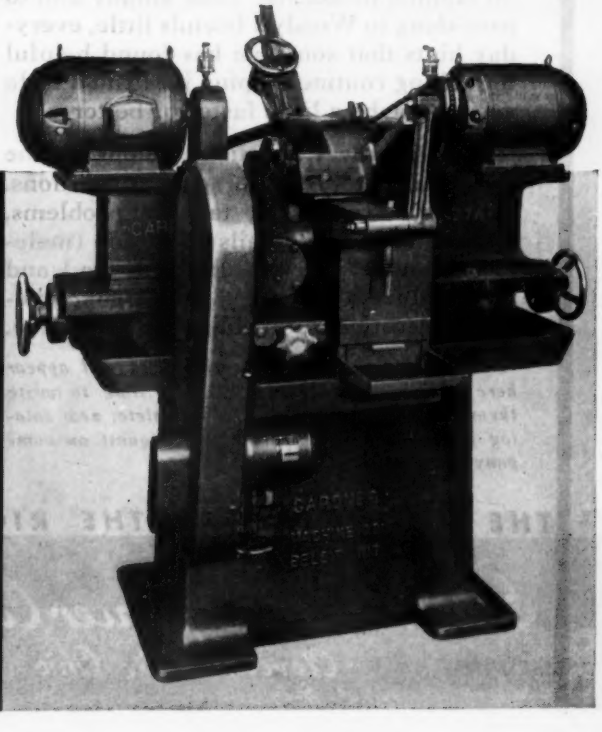
GARDNER MACHINE COMPANY
410 East Gardner St., Beloit, Wisconsin, U. S. A.

Use Modern GARDNER WIRE-LOKT ABRASIVES *on your* Disc Grinders!

BELOW: Tap stock, measuring from 3/32" up to 3/8" dia., x 3" long, ground on a No. 77A-12" Gardner Double Grinder at 30-40 pieces per minute. Stock removal averages .040" maximum, overall, and the tolerances of .008"-.010" for uniformity, are easily maintained.

Write for our 8-page bulletin —
"GARDNER FLAT SURFACE GRINDERS"





TAPPING TIPS

From Woody Spencer's Notebook

TAKE IT EASY, BROTHER, YOU'LL GET THERE QUICKER!

Once in awhile I run into a case where everything seems all right—taps right for the job, lubricants O.K., spindle speed is correct, yet the finished threads just don't check. That's when I begin to look for a little pressure in starting the tap. That's bad. Let the tap do the work. Forcing will vary the pitch or lead from that of the tap. And a lot of times you'll get oversize or bell mouth holes. Just remember the tap will find its own lead if you let it. Then it will thread true.

Woody Spencer's Tapping Tips don't pretend to be any technical solution for all tapping problems. They simply aim to pass along to Woody's friends little, everyday hints that someone has found helpful in making routine tapping jobs run a little easier, maybe a little faster or better.

The technical questions belong to the engineers and require specific solutions. So, if you're having tapping problems, send us complete details of the job (material, diameter, depth, lubricant, etc.) and our engineers will be glad to make specific suggestions. No obligation, of course.

**Note—Woody Spencer's Tapping Tips will appear here as regularly as "Woody" gets time to write them up. Look for them. Our complete, new catalog just off the press. Send your request on company stationery.*

THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company
Cleveland 3, Ohio

WHALE

WHALE BRAND

HY-FLEX

HACK SAW BLADES

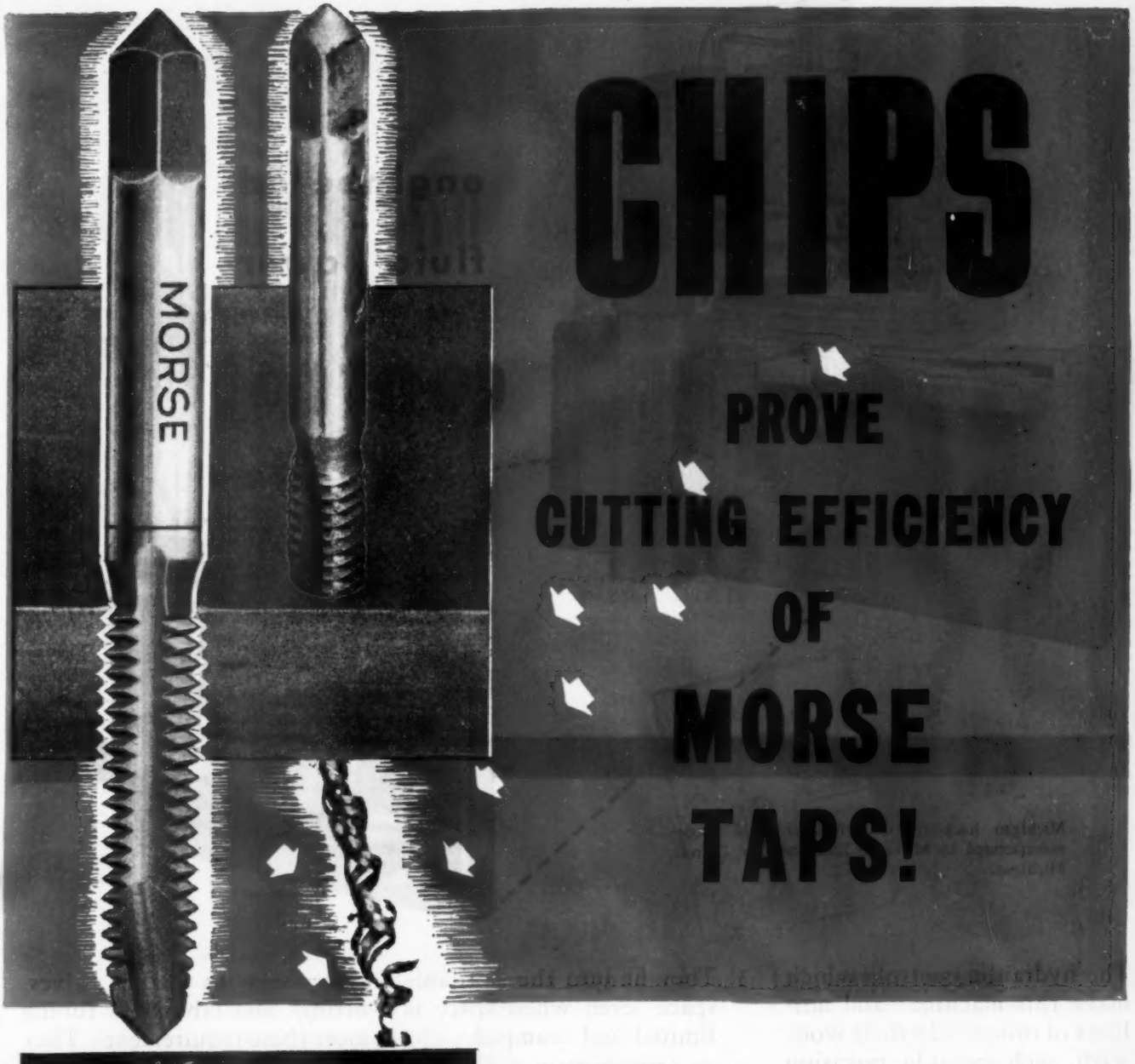
Each Forsberg Blade that carries the famous WHALE BRAND mark of quality is scientifically heat treated to add the toughness that gives these Blades their fine performance. They're gauged and checked throughout every step of their manufacture and given a stiff bending pounds test before you get them for use. The popular HY-FLEX Blade, shown above, meets today's demand for a medium priced blade which is extremely flexible, yet has the guts for solid service.

Here's a Whale of a Blade of a special analysis molybdenum, high speed steel that gives unusual cutting service. Can be used at the same cutting speeds as tungsten and deliver practically equal performance. If you want outstanding results on stubborn cutting jobs, ask your mill supply house for WHALE BRAND HY-FLEX and MO-HY BLADES and you'll get it.

Get to know the satisfaction in WHALE BRAND HACK SAW BLADES and FRAMES • BAND SAWS • COPING SAW FRAMES and BLADES • SCREW DRIVERS • HAND DRILLS. Ask for the catalog that describes these and other good FORSBERG TOOLS.

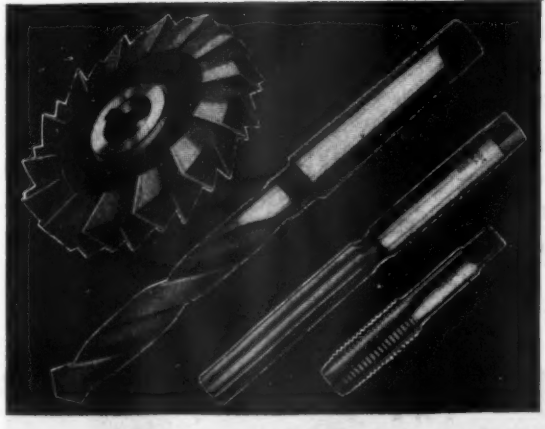
Forsberg

MFG. CO., BRIDGEPORT, CONN., U.S.A.



CHIPS

PROVE CUTTING EFFICIENCY OF MORSE TAPS!



MORSE two-fluted, spiral-pointed hand taps roll the chips ahead to prove cutting ease, speed and precision as they thread deep open-end holes. These taps effect measurable gains in quality and quantity production.

MORSE THERE IS A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY
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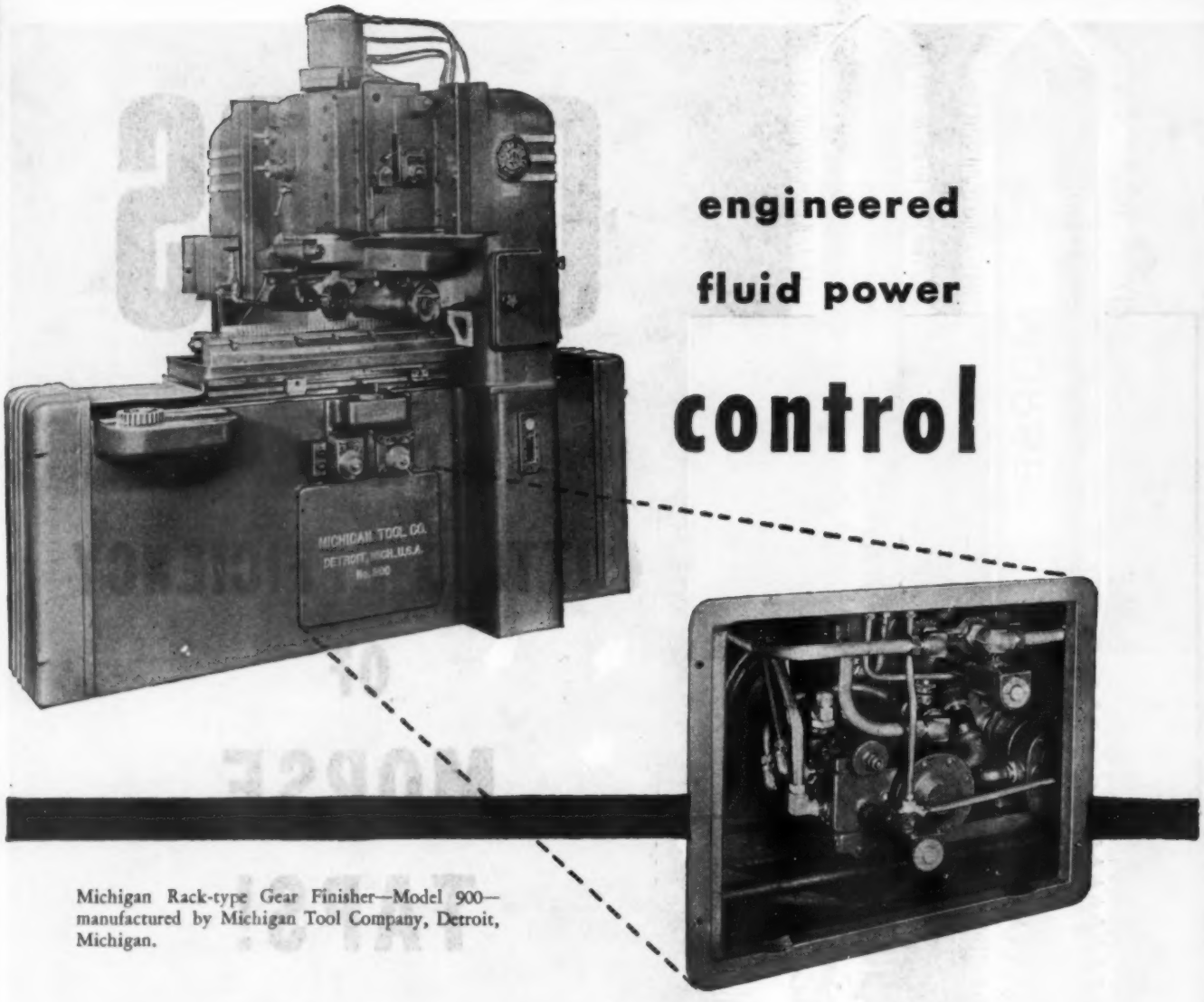


engineered fluid power control

Michigan Rack-type Gear Finisher—Model 900—manufactured by Michigan Tool Company, Detroit, Michigan.

The hydraulic controls which make this machine—and millions of others—do their work with such reliable precision call for tubing systems based on the principles of Fluid Power Engineering.

When properly engineered and built, these systems have certain "must" features—

1. They streamline the flow of fluids. This permits adequate response to control with minimum system capacity.
2. They make minimum demands on the power source —an economy feature.
3. They fit into the available space, even when space is limited and cramped.
4. They are planned for easy accessibility to all parts—for service and maintenance.
5. They have the smallest number of joints and connections — all leakproof — even under high pressure, vibration or abuse.

FLUID POWER engineered systems—with Parker valves, fittings and fabricated tubing meet these requirements. They are backed by more than twenty years of "know-how".

If you plan to use Fluid Power—if you need tubing installations for any purpose —ask a Parker engineer for recommendations. The Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio. Booklet on request.

PARKER

Get these two essentials of cost-saving lubrication

1. The right lubricant

2. In the right places

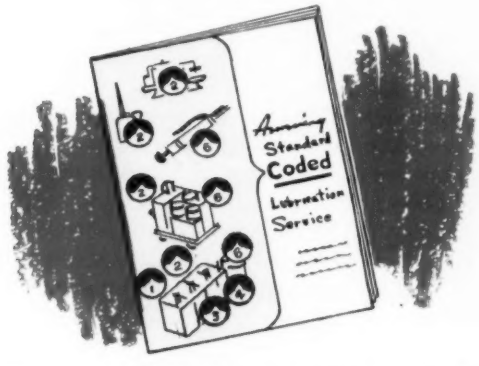
TWO HELPFUL SERVICES are offered by Standard Oil to manufacturers in the Middle West. They are designed to take "guess work" out of plant lubrication and to eliminate costly and wasteful repairs resulting from the use of incorrect lubricants.

1 CODED 2 LUBRICATION

Lubrication Engineering Service

Standard Oil has experienced Lubrication Engineers located in principal cities throughout the midwestern states shown on the map.

These Engineers have two advantages when analyzing your lubrication needs. They are familiar with the operation of all types of plant equipment—as are your plant personnel—and they have a complete knowledge of the lubricants available to meet your requirements. Thus Standard Oil Lubrication Engineers can help you *get the right lubricant.*



Standard Coded Lubrication Service

In addition, these Engineers can supply you with a simple Coded System for applying lubricants. Briefly, the system provides for numbering all lubricants used in your plant. Every drum, oil can or grease gun used for dispensing lubricants is identified by a number to indicate the lubricant it contains. Each spot to be lubricated is also marked by a number to indicate the lubricants required.

The booklet illustrated fully describes this system. If your plant is located in the Middle West, a Lubrication Engineer will be glad to call and explain how Coded Lubrication can be applied in your plant or perhaps combined with your present system.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for a copy of the booklet or for the Engineer nearest you.

Buy more War Bonds

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . .

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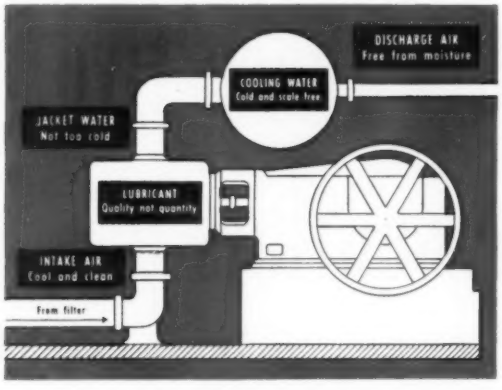
To help you avoid deposits in compressors



CONDITIONS under which compressors operate, particularly under today's heavy loads, tend to cause excessive deposits.

Improper lubrication is not always responsible for these deposits, but a compressor lubricant with the right qualities can reduce or eliminate many of them. Stanoil is such a lubricant.

The causes of some of the more common compressor operating problems and suggested cures, as well as the advantages of Stanoil, are listed on this page.

A Standard Oil Lubrication Engineer will be glad to help you apply the right grade of Stanoil to overcome excessive deposits and wear on your compressors. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you.

STANOIL

Buy more War Bonds

Causes and Cures

Valve Deposits—Oxygen in the air and heat generated by compression tend to oxidize conventional oils, causing the formation of carbon and asphaltic substances which deposit on valves.

To avoid oil oxidation, keep intake air temperatures as low as possible. Be sure inter-coolers and after-coolers are supplied with an ample supply of cool water, and keep them free from scale and rust. Use Stanoil, from which the unstable hydrocarbons—those affected by heat and oxygen—have been removed, thus eliminating many troublesome deposits at the source.

Dirty Intake Air. The enormous volume of air required by compressors may introduce a large quantity of dirt and dust which contributes both to excessive wear and deposits. Use efficient air screens and keep them clean. Be sure they are not located near a source of dirty air. Use Stanoil which resists the formation of gummy deposits that might collect dirt and dust and add to deposits on valves.

Condensation in Inter-Coolers. Water in the inter-cooler should be cold enough to condense oil and moisture in the compressed air so that they can be removed before entering the high pressure cylinders where they might cause excessive deposits.

Over-Lubrication. Oil is not burned up in compressors as it is in internal combustion engines, nor is it washed away as it is in steam engines. Oil remains in the compressor cylinder, and if it is of the right quality, very little is needed. An excessive amount of oil increases the possibility of deposits in valves, inter-coolers and air lines. Compressors usually require from 1/5 to 1/10 as much oil as steam cylinders of similar size. Because of the high lubricating quality of Stanoil, only a very small amount is needed to secure adequate lubrication.

STANDARD OIL COMPANY (INDIANA)

STANDARD SERVICE

★ LUBRICATION ENGINEERING

Now! an IMPROVED
KENNAMETAL LATHE FILE

- *CUTS STEEL NO ORDINARY FILE CAN TOUCH*
- *PERMITS FILING SPEEDS 3 TO 10 TIMES THOSE POSSIBLE WITH STEEL FILES!*
- *OUTLASTS MILL CUT FILES 50 TO 200 TIMES*

This new Kennametal Lathe File retains all the time- and cost-saving characteristics of previous designs —*cuts steel up to 62 Rockwell C hardness; does outstanding job on cast iron and non-ferrous materials; permits filing operations at carbide tool turning speeds; produces superior finish.*

And now, in addition, it provides these new features — *longer filing surface; quick, easy blade replacement; greater handling convenience.*

The filing surface comprises two 4" long Kennametal blanks which have cylindrical nuts brazed to them, and are attached to the aluminum alloy handle by screws. After long service (up to 200 times that obtained from steel files) the blanks can be readily replaced.

The handle grip has a thumb rest and knuckle guard. An extension of the handle beyond the filing surface provides a secure finger hold. A hole in this extension permits the file to be hung up.

On the first production run, a Kennametal Lathe File usually saves its cost many times over. Order one—let it demonstrate to you an astonishingly low filing cost-per-piece.

Features

REPLACEABLE BLANKS

Kennametal blanks are attached by Phillips head screws. Two types are available: fine (30 teeth per inch); and coarse (20 teeth per inch).

LIGHT WEIGHT

Weighs less than one lb. Can be handled with ease, and used for long periods of time with minimum expenditure of energy.

HAND-FITTING GRIP

Handle is comfortable—it fits the hand; provides secure grip. Opposite end of file provides convenient finger hold.

SPECIFICATIONS AND PRICES

COMPLETE FILE		FILE BLANK—2 REQUIRED		
CAT. No.	PRICE EACH	CAT. No.	TEETH/ INCH	PRICE EACH
F-45*	$18.50	F-453	30	$7.50
		F-452	20	7.50

* Furnished with blanks having 30 teeth/inch unless otherwise specified.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

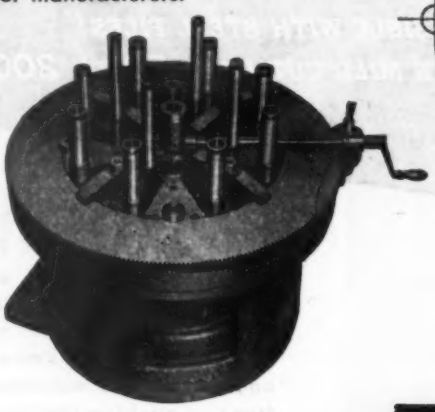
KENNAMETAL *Inc.*, LATROBE, PA.

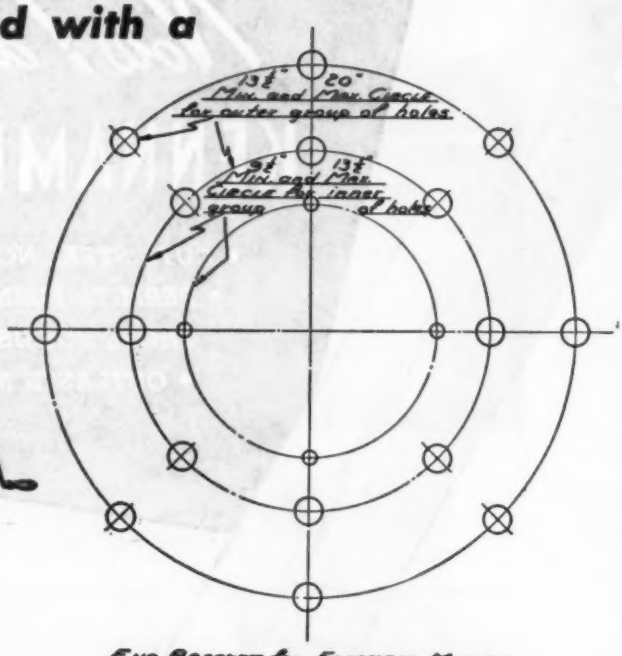
MOTOR END BRACKETS . . . a troublesome drilling problem satisfactorily solved with a HOEFER MULTIPLE SPINDLE HEAD

● On account of the quantities in which these End Brackets are run through, a quickly adjustable center head for both inner and outer circles solved the problem for several large motor manufacturers.

The line drawing indicates the independent adjustments possible on both outer and inner rows of holes by means of spindle adjusting scrolls driven through gears, quickly setting either set of spindles on the proper bolt circle.

HOEFER has served many manufacturers in the solutions of their drilling and allied problems —maybe they can help you.

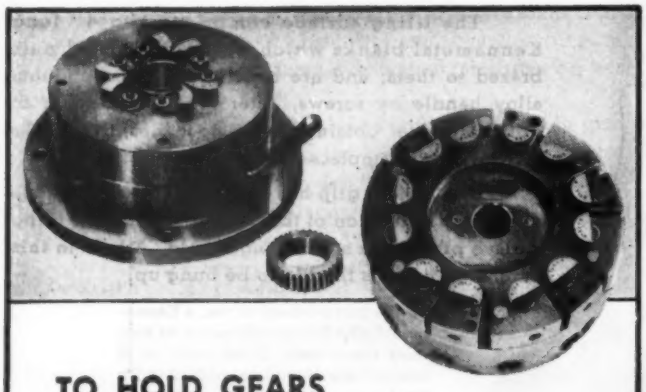




End Bracket for Electric Motors
Cast Iron

Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*



TO HOLD GEARS
with precision for boring or grinding
HAVE TEETH GRIPPED ON LINE OF ACTION
Principle used only in

MATCH-IT GEAR CHUCKS

Method eliminates distortion. Gears have perfect, round holes. Made for internal and external gears, for spur and helical gears, and for countershaft type gears.

Send for catalog

LeMaire Tool & Manufacturing Co.
2665 So. Telegraph Rd., Dearborn, Mich.

Whoever thinks of hardness testing equipment thinks of the

"ROCKWELL" HARDNESS TESTER

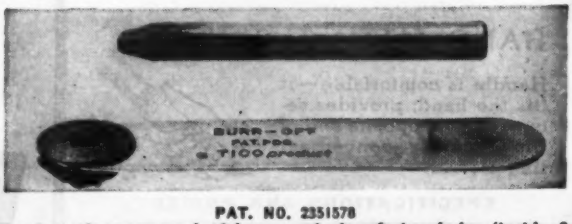
Now and always made only by

WILSON

MECHANICAL INSTRUMENT CO. INC.
357 Concord Ave., New York 54

An Associate Company of American Chain & Cable

"BURROFF"



PAT. NO. 2351578

For fast clean removal of burrs and chamfering holes (inside & outside) of multi-walled parts—where regular solid countersinks will not reach.

CONTACT:
JOHN H. GRAHAM & CO.—105 DUANE ST., N. Y. C.

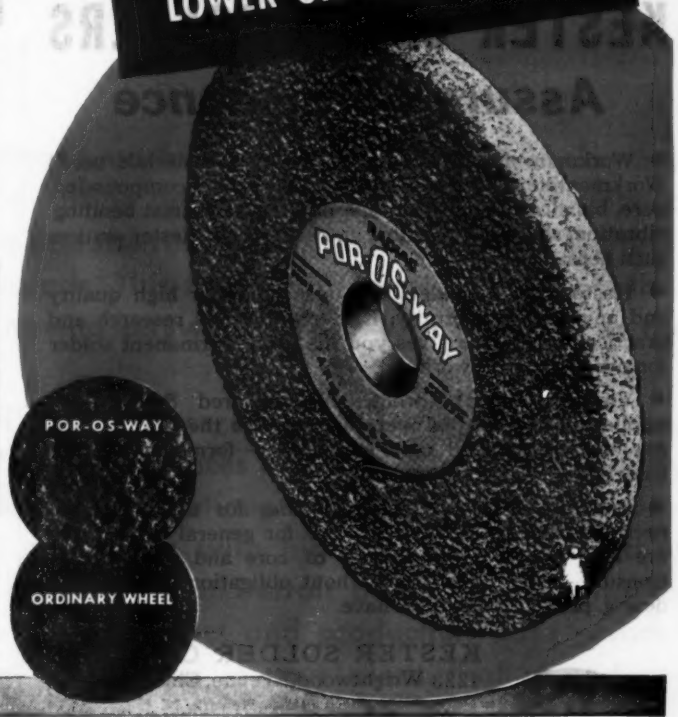
MADE BY
TOOL IMPROVEMENTS CO. — SEAFORD, NEW YORK

UNBELIEVABLE PERFORMANCE ON CARBIDE-TIPPED TOOLS!
Green silicon carbide is back from the war in Por-os-way wheels for carbide-tipped tool grinding. Put it to work! You'll actually be amazed at its performance—bringing you 2 to 5 times faster, cheaper grinding without burning or discoloring!

YOU'VE got a happy, satisfied crowd of machinists when you let them go to town with Por-os-way—the open structure grinding wheel that cuts deeper, faster, *cooler.* Machinists *go* for it! They like it—the way it bites through toughest metals like lightning, the way it cuts down rejects, the way it stays clean and lasts longer. And, brother, in the days ahead *when costs must be cut to the bone*—you'll go for Por-os-way, too! It's one sure way to get the edge on competition—and a hatful of praise from the boss. Call in a Por-os-way engineer and make us *prove* we're right when we say, "No wheel has yet bettered a Por-os-way!" A. P. de Sanno & Son, Inc., 430 Wheatland Street, Phoenixville, Pa., Since 1893.

LOOK AT THE DIFFERENCE!
Your eye tells you at a glance why Por-os-way is *different.* See the *extra porosity* that gives you over 8 distinct operating advantages!

2 TO 5 TIMES LOWER GRINDING COSTS



RADIAC*

POR-OS-WAY*

The Precision Grinding Wheel

THE WHEEL THAT COSTS THE MOST AT FIRST . . . COSTS THE LEAST AT LAST

NO GROAN, NO MOAN, NO GRUNT IN POR-OS-WAY SURFACE GRINDING!
Try Por-os-way segments for surface grinding. Notice the greatly increased speed, notice how quietly the cutting edges of Por-os-way dig deep into the metal. Por-os-way *cuts,* doesn't "scrape" the surface! Time out for dressing is greatly reduced, too!

*T. M. Reg. U. S. Pat. Off. Copyright, 1945 A. P. de Sanno & Son, Inc.

Match Fine Workmanship with Materials that LAST!

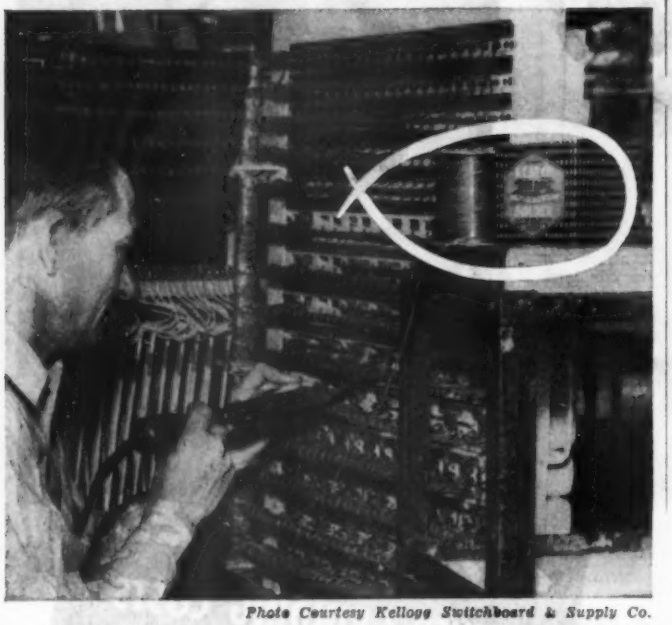


Photo Courtesy Kellogg Switchboard & Supply Co.

KESTER CORED SOLDERS

Assure Permanence

- Workmanship is only as good as the materials used! Workmanlike soldering requires an accurately compounded, pure, balanced solder—one that holds tight against bending, vibration, shock, contraction, and expansion. Kester assures such permanence!
- Kester Cored Solders are unexcelled for high quality and unvarying uniformity. Kester's 46 years research and practical experience gives you the right, permanent solder for every type of work.
- Virtually mistake-proof, Kester Cored Solders are applied in one simple operation because the positive acting flux is contained right in the core—forms tight, clean solder-bonds, sure to stay put!
- Specify *Kester Rosin-Core Solder* for electrical connections—*Kester Acid-Core Solder* for general work. Both are available in a wide range of core and strand sizes. Consult Kester engineers, without obligation, on any soldering problem you may have.

KESTER SOLDER COMPANY
4223 Wrightwood Avenue, Chicago 39, Ill.
Eastern Plant: Newark, N. J.
Canadian Plant: Brantford, Ont.

KESTER
Cored Solders
STANDARD FOR INDUSTRY

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

- With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
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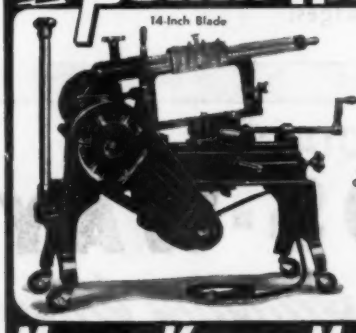
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

POWER HACK SAW



LOW PRICED
SELF-CONTAINED
PORTABLE
STURDY
READY TO WORK
ECONOMICAL
EXPORT DEPT.
1111 SO. FERRY BLD'G.
NEW YORK 4, N.Y.
WRITE FOR BULLETIN NO. 400

MILLER-KNUTH MFG. CO. OMAHA, NEB.

BROACHING A DOVETAIL SLOT

IN AN ALUMINUM RING

Every Fifteen Seconds

THIS large fixture is used with a horizontal broaching machine. The part is clamped in place and the fixture shuttles into the cutting position. When the cut is completed the table shuttles out of the cutting position and the ring indexes while the ram is returning. The complete cycle requires fifteen seconds. This fixture is adjustable for slots that are at different angles as well as rings having anywhere from 40 to 60 slots in the perimeter.

Extremely high production is only one of the features of a well designed broaching set-up. Broaching produces fine finish and close tolerances on parts of all types. Nearly every plant has several operations where broaching can combine high speed production with high quality of product at lower cost. Call in the nearest Detroit Broach representative. He will give you complete cost and production data without obligation on any operations in your plant that are adaptable to broaching.

MEMBER BROACHING TOOL INSTITUTE

DETROIT *Broach* COMPANY

20201 SHERWOOD AVENUE · DETROIT 12, MICHIGAN

SO MANY JOBS WITH THIS ONE STEEL

BTR TOOL STEEL

WHAT IT IS: Bethlehem Tool Room (BTR) is *the* standard general-purpose, oil-hardening tool steel of the industry.

WHAT IT HAS: A carbon-chrome-tungsten-vanadium combination that assures safe hardening . . . durable cutting edge . . . deep hardening . . . low distortion and small dimensional changes.

WHY IT'S EASY TO HANDLE: Annealed for easy machining.

Has uniform analysis and hardenability.

Simple to heat-treat.

Does not decarburize readily.

TYPICAL USES: For dies employed in the shaping, forming, blanking, punching, and shearing of both ferrous and non-ferrous materials.

For master hobs, broaches, drill bushings, knurling tools, gages, taps, and many other commonly used tools and parts.

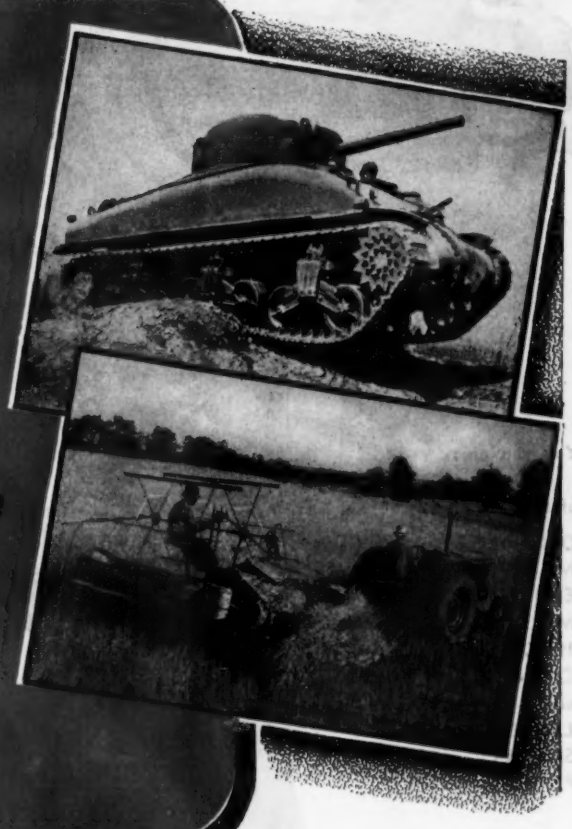
If you're looking for *one* steel that will do *many* types of jobs, stock BTR in your tool room. It's a multi-purpose steel; you'll be amazed at its versatility. Pleased, too, at the money it saves you, both directly and indirectly. Pick up the telephone and ask your distributor for BTR.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Bethlehem Steel Export Corporation, New York City

BETHLEHEM TOOL ROOM... one of Bethlehem's *Big 8* Tool Steels

WHEN RECONVERSION TO CIVILIAN PRODUCTS makes LOW-COST an important production factor... use dependable

OAKITE CLEANING



Materials... Methods... Service

Surface preparation of metal parts before final finishes are applied is a PRODUCTION OPERATION importantly influencing product COST. Dependable, fast, economical Oakite cleaning helps you keep this operation at or below specified limits.

36 Years' Experience

Long experience serving thousands of plants manufacturing practically every civilian type product, implemented by successful experience in finding the right answers to complex production-cleaning problems on a wide range of war supplies, provides the sound basis and reasons that prompt so many leading concerns to select and rely on the Oakite organization for authoritative technical help and the materials and methods that keep production volume up and costs down.

You are invited to apply this valuable experience to your work, particularly when changing over from war to civilian supplies.

70 Different Cleaning Materials

Available to meet the high standards of today's stream-lined production, whether for degreasing, machining, grinding, stamping, drawing, burnishing, descaling, rust removal or other related operations, are over 70 different Oakite materials specifically designed to assure speed, thoroughness and production economy on the work to which they are applied. Uniformity and high quality of Oakite materials is maintained and assured through constant factory batch-inspection by Oakite chemical engineers. Each Oakite material is guaranteed to perform as specified or it costs you nothing.

Nationwide Service

Oakite's field staff of technically trained men with their intimate knowledge of metal surface preparation requirements and the operations associated with them are always at your service, as also our chemical and mechanical research laboratories, without cost or obligation. This personal help and advisory service is yours for the asking on any reconversion production-cleaning problem.

Stocks of various Oakite materials are warehoused at strategically located transportation points that make possible delivery of materials when they are needed.

TELL US YOUR PROBLEM: The operations of cleaning and surface preparation figure so largely in production cost that Oakite offers all its comprehensive facilities and "know-how" to keep them on an economical basis. Whatever your product or cleaning problem, write us today. All inquiries promptly answered.

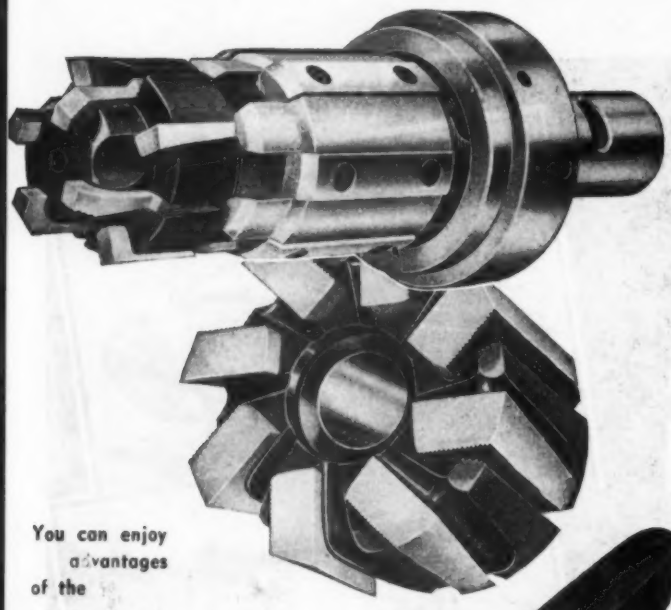
OAKITE PRODUCTS, INC., 14F THAMES STREET, NEW YORK 6, N. Y.

Technical Service Representatives Located in All Principal Cities of the United States and Canada

Meet Postwar Competition

WITH THESE MODERN PRECISION TOOLS

Get Better, Faster Production



You can enjoy advantages of the

O K SYSTEM in MILLING CUTTERS END MILLS, FACE MILLS, BORING HEADS, REAMERS, COUNTERBORES, and single-point tools for LATHES, SHAPERS, PLANERS, etc.

•

FREE BOOKLET ON GRINDING MILLING CUTTERS

Contains useful data on grinding, adjusting, reblading, clearances, etc. Profusely illustrated, clearly worded. Sent without charge to any interested shop man.

THE O K TOOL CO., SHELTON, CONN.

Originators & Sole Manufacturers of the

TRADE OK MARK **SYSTEM**

OF INSERTED-BLADE METAL CUTTING TOOLS

You can get **ACCURATE CROSS-CENTER DRILLING**

and many varied uses

with **UNIVERSAL'S**

CENTER DRILL and MILL VISE

A PRECISION WORK HOLDING FIXTURE

Send for information of its many versatile uses

Universal Engineering Co.

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415 BOOK BLDG. • DETROIT 26, MICH.

TORNADO WRITING TOOLS and ETCHERS

TORNADO Electric Writing Tool. Used for marking everything. Easily portable anywhere.

Protect Valuable Tools!

TORNADO Electric Writing Tools and Etchers mark everything of value that might be lost, mispiaced or stolen. TORNADO Writing Tool marks brass, marble, tile, glass, plastics, wood, hard rubber, aluminum, steel and bronze.

TORNADO Electric Etcher marks iron, steel and steel alloy products. Burns permanent identification on various types of tools, dies, gauges, plates, gears, etc. Protects your valuable tools and other portable equipment!

WRITE FOR COMPLETE DETAILS

BREUER ELECTRIC MFG. CO.

5084 N. Ravenswood Ave., Chicago

The RANDALL & STICKNEY Platform Gauge

. . . . takes work up to 7 inches

Work of similar size can be quickly and easily inspected by setting gauge head at desired height with standard block or plug. Spindle on gauge head travels ½".

Dial graduated 0 to 50 in thousandths; second-hand records 10ths of inches. Can be furnished to read to .01 mm.

Base 8" square; height 13"; weight 18½ lbs.

Investigate Now!

RANDALL & STICKNEY

Waltham 54, Mass.

PERFORMANCE records of Cleveland Twist Drills and other tools prove their superiority beyond question. Over and over they illustrate the money-saving, work-saving qualities that are built into every Cleveland tool. Remember, to get the largest number of holes per grind, be sure to investigate Cleveland Drills.

• Your Industrial Supply Distributor can be mighty helpful in solving your retooling problems. Just as he worked with you in normal times before the war, and during the conversion era . . . so now he stands ready to help you again.

Today as always, it pays to

Telephone your

INDUSTRIAL SUPPLY DISTRIBUTOR FIRST!

ARMY NAVY ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
CLEVELAND

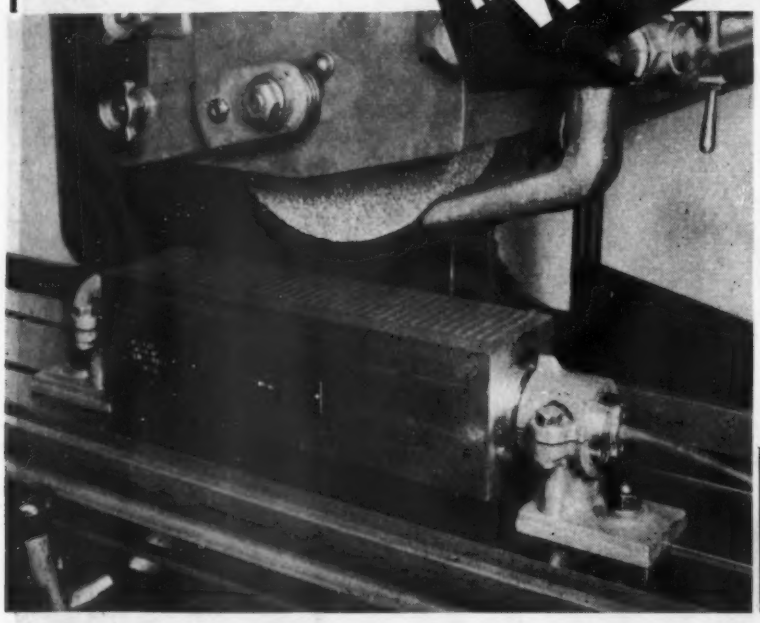
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

20 THOMAS ST. NEW YORK 9 NORTH JEFFERSON ST. CHICAGO 650 HOWARD ST. SAN FRANCISCO
6915 SECOND BLVD. DETROIT BRUNEL ROAD OLD OAK COMMON LANE, ACTON, LONDON W. 3, ENGLAND

One of a series of advertisements showing specific applications of Walker Magnetic Chucks on specific types and makes of machines.

"WALKERS" AT WORK

The Walker Magnetic Chuck shown here is of the Swiveling Type and is mounted on a 10" Norton Hydraulic Surface Grinder.



CONVENIENCE . . . plus Accuracy . . . plus Versatility are offered in WALKER CHUCKS

This Norton Surface Grinder, equipped with a Walker Swiveling Magnetic Chuck, can handle a wide variety of precision work with set up time cut to a minimum. Regardless of the angle at which work is held, the uniform magnetic strength over the face of the chuck can be depended on to hold the work securely at all times.

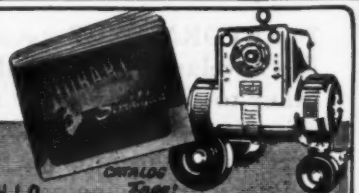
The use of Walker Magnetic Chucks by leading machine tool builders over a period of many years is assurance that "Walkers" are recognized and accepted for their holding power, utility and convenience. Ask your machine tool manufacturer.

Full information on the "Walker" line is available on request. Included are improved types of Longitudinal and Bar Pole Electro-Magnetic Chucks and Permanent Magnetic Chucks in Plain and Swivel types. *Write today.*

O. S. WALKER CO., INC.
100 Rockdale St.
WORCESTER 6, MASS.

HOBART

Simplified arc welders



HOBART BROTHERS COMPANY, BOX AM-8-16 TROY, OHIO

CATALOG FREE!

Famous for

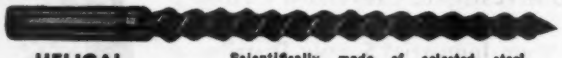
- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 238 Jan. 15, '48, American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Los Angeles: A. C. Behringer, 384 N. San Pedro St., San Francisco: Guy Reynolds, 464 Vernon St., Oakland, Canada: F. Barber Machinery Co., Toronto, Canada.

HOLMAN BETTER, FASTER HOLE FINISHING



HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

. . . for those TOUGH drawing jobs—

The performance of SuperKool in accomplishing impossible draws has made friends for it in plants producing all types of metal products from kitchenware to bombs. SuperKool spreads smoothly, adheres well, and holds up under highest pressures. Stuart Oil Engineers are qualified by long experience to help you with your metal working problems. D. A. Stuart Oil Company, Limited, 2729 So. Troy Street, Chicago 23, Illinois.

Stuart's SUPERKOOL DRAWING LUBRICANT

D. A. Stuart Oil Co.

FOR ALL CUTTING FLUID PROBLEMS
Stocks in All Principal Metal Working Centers

ESTABLISHED 1865

A TOOL KIT IN ONE TOOL!

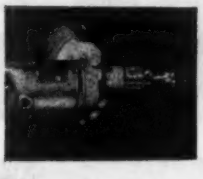
Illustrated is Model No. 4 with 2½" to 4" expansion capacity and ¾" thickness capacity. $25.00

One Clark Adjustable Hole Cutter Replaces a Whole Tool Kit of Fixed Radius Cutters

You have a tool crib at your elbow when you're using Clark Cutters. They give a smooth finish the first time without filing or deburring in steel, hard fibre, plastics, wood and other materials. Models cover variable expansions from ⅝" to 5" holes and have thickness capacities from thin sheets to 1".

Clark Hole Cutter is simple to adjust, yet performs more efficiently than fixed radius cutter of same size.

In portable electric drill, Clark Hole Cutter easily cuts steel plate as well as pipe, plastics, hard fibre, Transite, etc.



FOR COMPLETE INFORMATION, CALL YOUR CLARK CUTTER JOBBER TODAY, or write for catalog. AM-8-HC

Adjustable Tool Holder

Grinding Fixture

CLARK CUTTERS

Robert H. Clark Company

9330 SANTA MONICA BOULEVARD • BEVERLY HILLS, CALIFORNIA

Adjustable Counterbore

Adjustable Facing Mill

ADJUSTABLE CUTTING TOOLS FOR ALL MATERIALS

Get Gargoyle Cylinder Oil 600-W, to

PROTECT THIS WORM AGAINST WEAR!

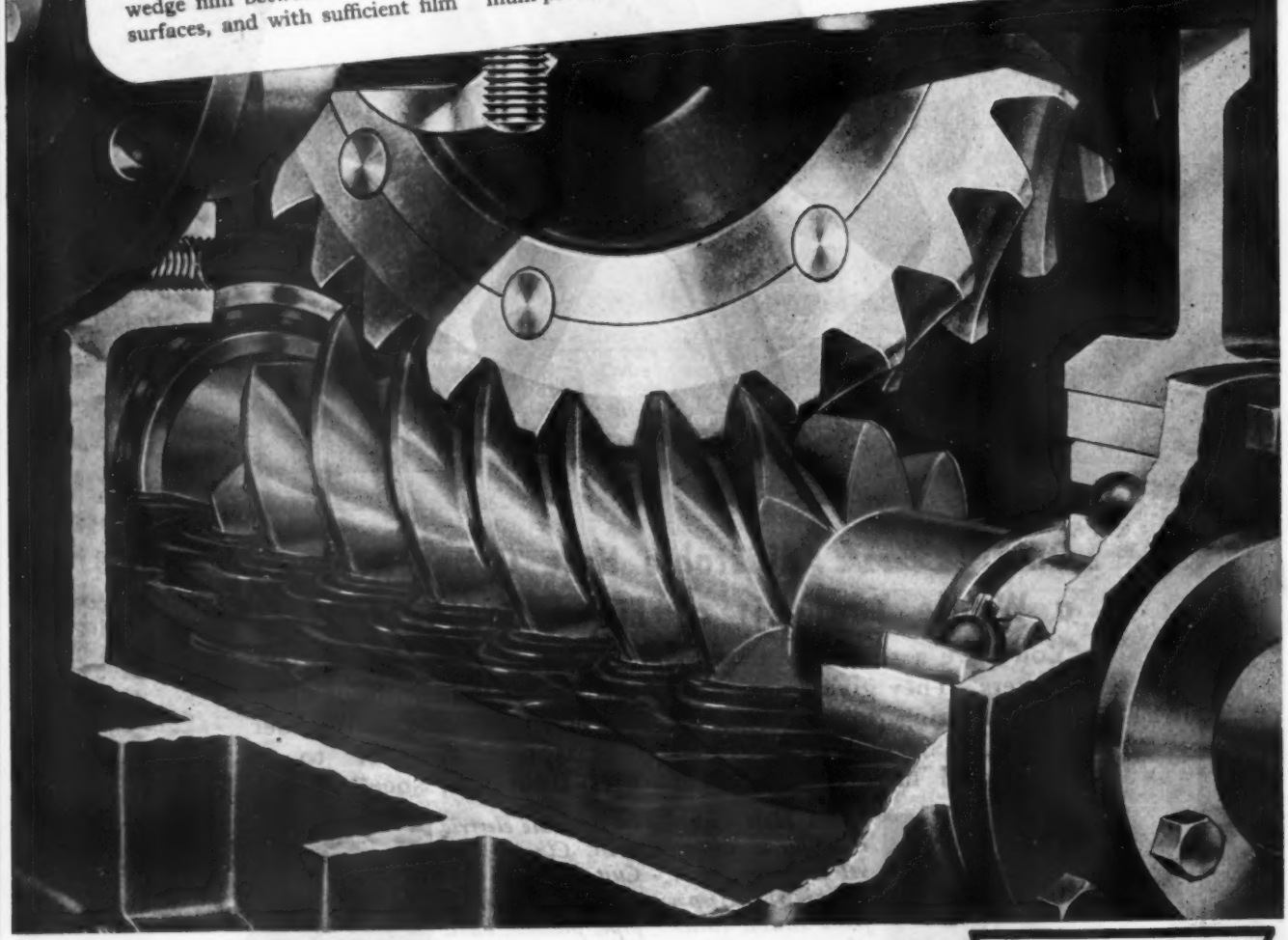
ON stepped-up schedules, this worm gear takes continuous heavy pressures hour after hour and day after day. To stay on its job, it must be protected against wear and scoring.

This calls for a lubricating oil with body heavy enough to form a wedge film between the meshing surfaces, and with sufficient film strength to protect tooth surfaces, even if the film is squeezed to microscopic thinness.

You can count on Gargoyle Cylinder Oil 600-W, to meet both of these important requirements for worm gear drives. Operators now using this outstanding product report both long oil life and maximum protection of tooth surfaces.

Specify high-quality Gargoyle lubricants for every machine you operate and get peak machine efficiency for peak production records.

SOCONY-VACUUM OIL CO., INC.
Standard Oil of N. Y. Div. · White Star Div. · Lubrite Div. · Chicago Div. · White Eagle Div. · Wadhams Div. · Magnolia Petroleum Co. · General Petroleum Corp. of Calif.



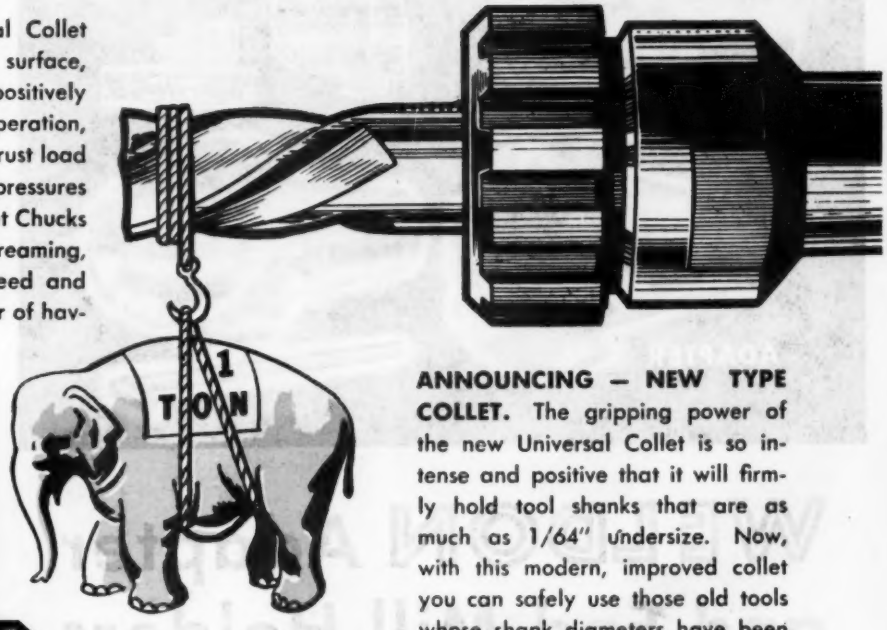
SOCONY-VACUUM'S 5 Steps to Lower Production Costs:

1. Lubrication Study of Your Entire Plant
2. Lubrication Schedules and Controls
3. Lubricant Storage and Handling System
4. Skilled Engineering Counsel
5. Progress Reports of Benefits Secured

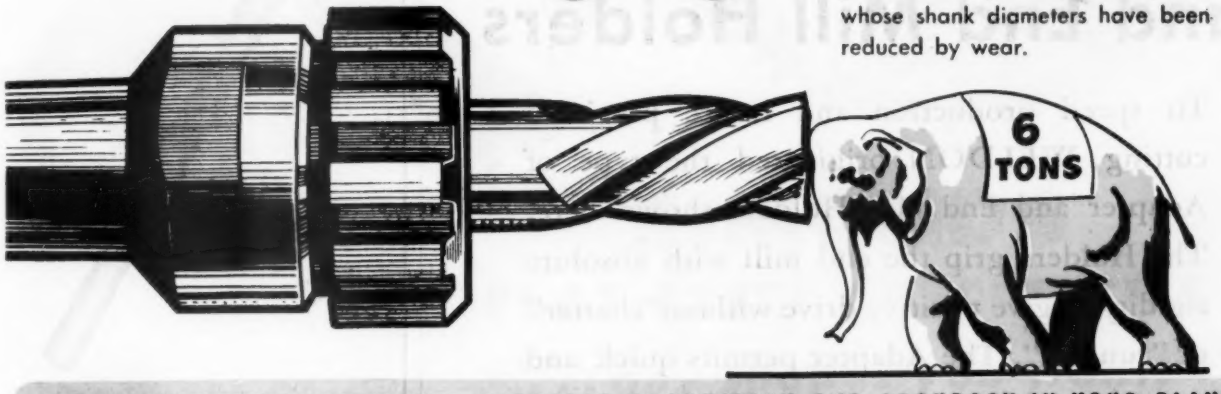
GARGOYLE Lubricants

6 TON THRUST LOAD, 1 TON RADIAL LOAD FAIL TO MOVE TOOLS GRIPPED IN UNIVERSAL COLLET CHUCKS

The improved collet in a Universal Collet Chuck grips tools on a continuous surface, instead of at only a few points. It positively locks tools throughout the work operation, securely holding them even under thrust load pressures of 6 tons and radial load pressures of 1 ton. You can use Universal Collet Chucks for drilling, tapping, end milling, reaming, and similiar operations at high speed and with heavy feeds, without the danger of having tools loosened by extreme vibration. Thus, Universal Collet Chucks save you money because they reduce down time and lessen tool wear and breakage. Write for full information.



ANNOUNCING — NEW TYPE COLLET. The gripping power of the new Universal Collet is so intense and positive that it will firmly hold tool shanks that are as much as 1/64" undersize. Now, with this modern, improved collet you can safely use those old tools whose shank diameters have been reduced by wear.

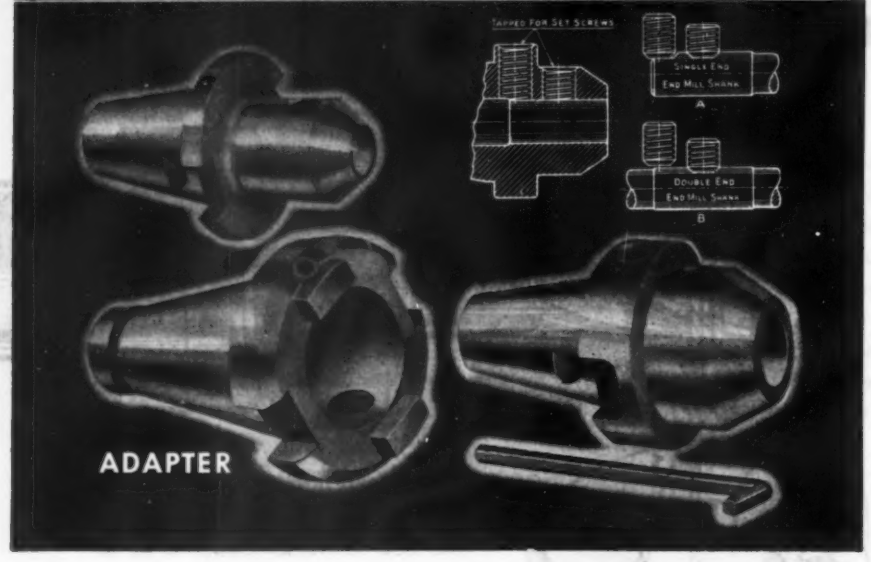


UNIVERSAL TOOLS THAT WILL INCREASE PRODUCTION AND ACCURACY IN YOUR PLANT

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH, MICHIGAN — Fighter Plane Given by Employees — 20% Employee Bond Deductions

YESTERDAY'S PIONEER . . . TODAY'S LEADER



WELDON Adapter and End Mill Holders

To speed production and insure precision cutting, WELDON originated the type of Adapter and End Mill Holders shown here. The Holders grip the end mill with absolute rigidity to give positive drive without "chatter" or "run-out". The Adapter permits quick and easy change from one size holder to another without loosening the spindle draw bar. Accommodates both single and double end mills in shank diameters of seven sizes. These are stock items designed and built to the WELDON quality standard.

Insist on WELDON TOOLS FOR WELL DONE JOBS.

Write for Catalog 8-B

THE WELDON TOOL CO. *Cleveland 4, Ohio*

3000 WOODHILL ROAD

IMMEDIATE DELIVERY

No. 1 to 60
New High Speed
Long Length

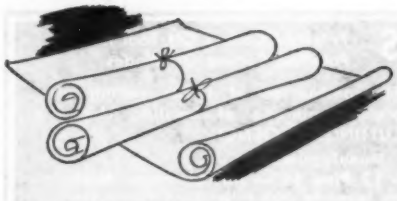
DRILLS

No. by Gage	*Length*	*Our Price Net Each*
1 to 10	6¼	$ .75
11 to 20	5¾	.75
21 to 30	5⅜	.75
31 to 40	5¼	.75
41 to 50	4½	.75
51 to 60	4¼	.75

If you buy 60 drills or more — 20% discount

VICTOR
MACHINERY EXCHANGE
INC.
251 CENTER STREET
NEW YORK N. Y.

SIMONDS
FLAT STEEL SPECIALTIES
. . . any shapes you want!



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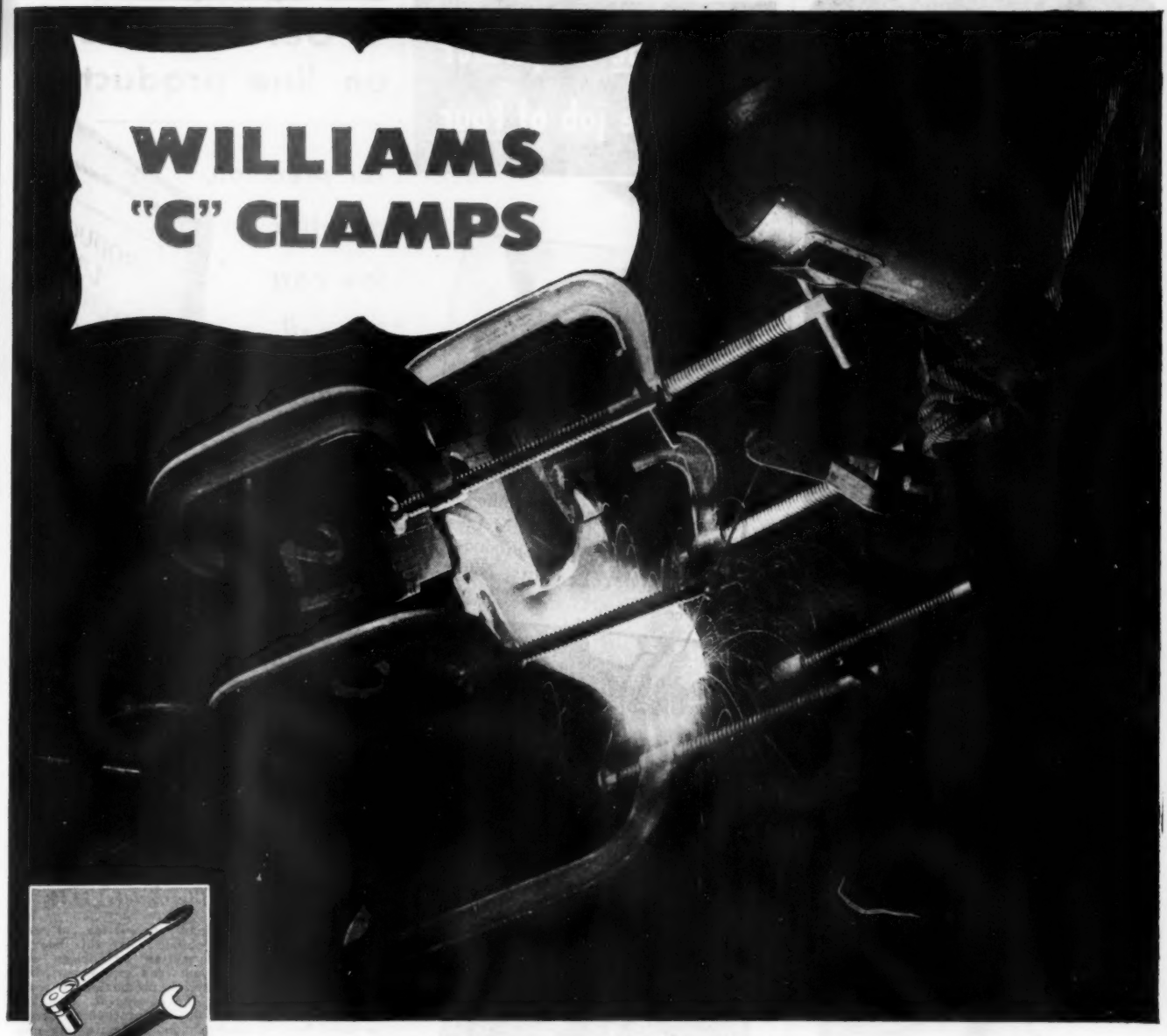

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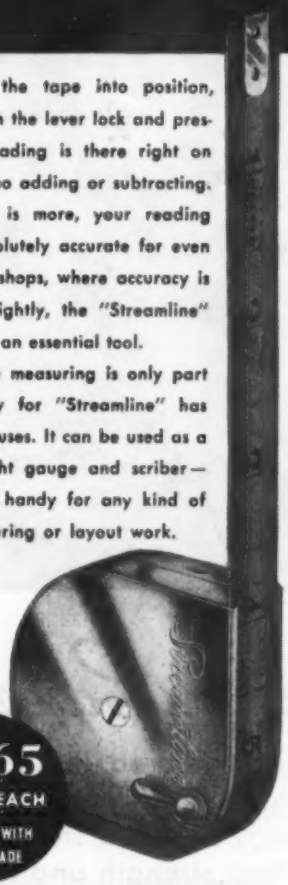

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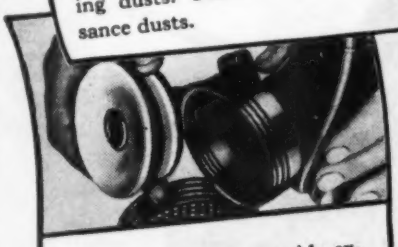

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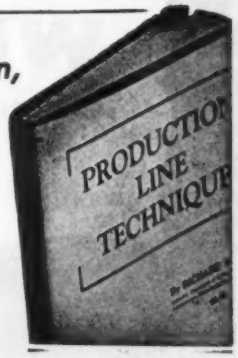

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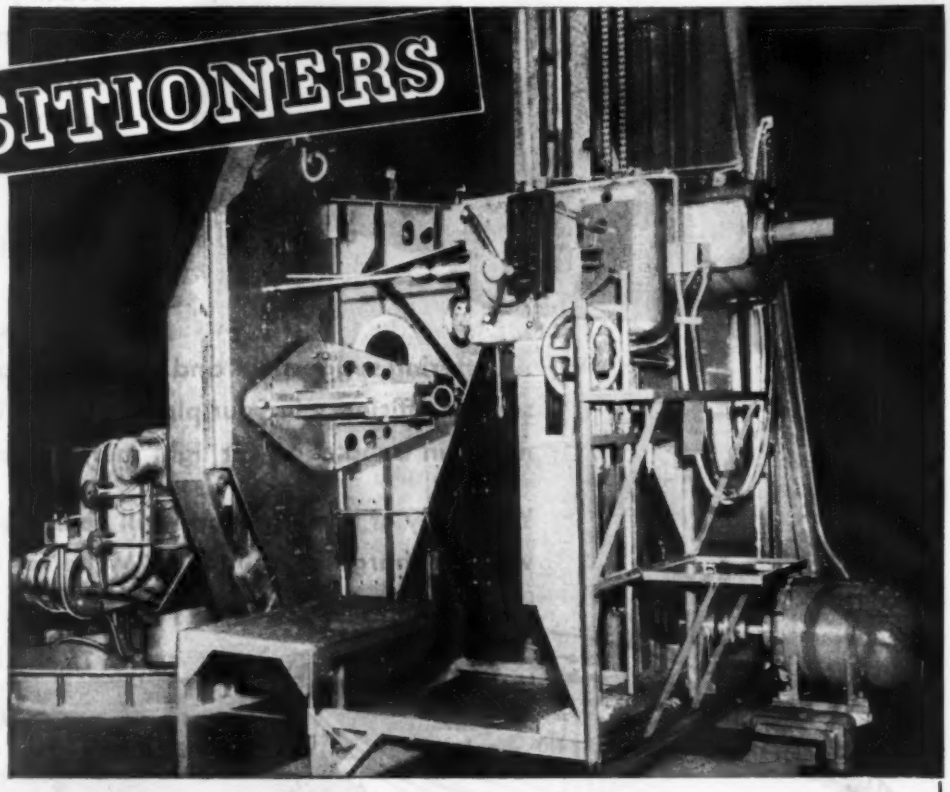

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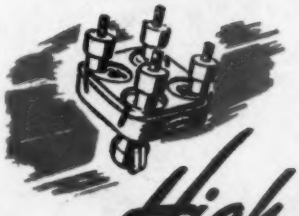

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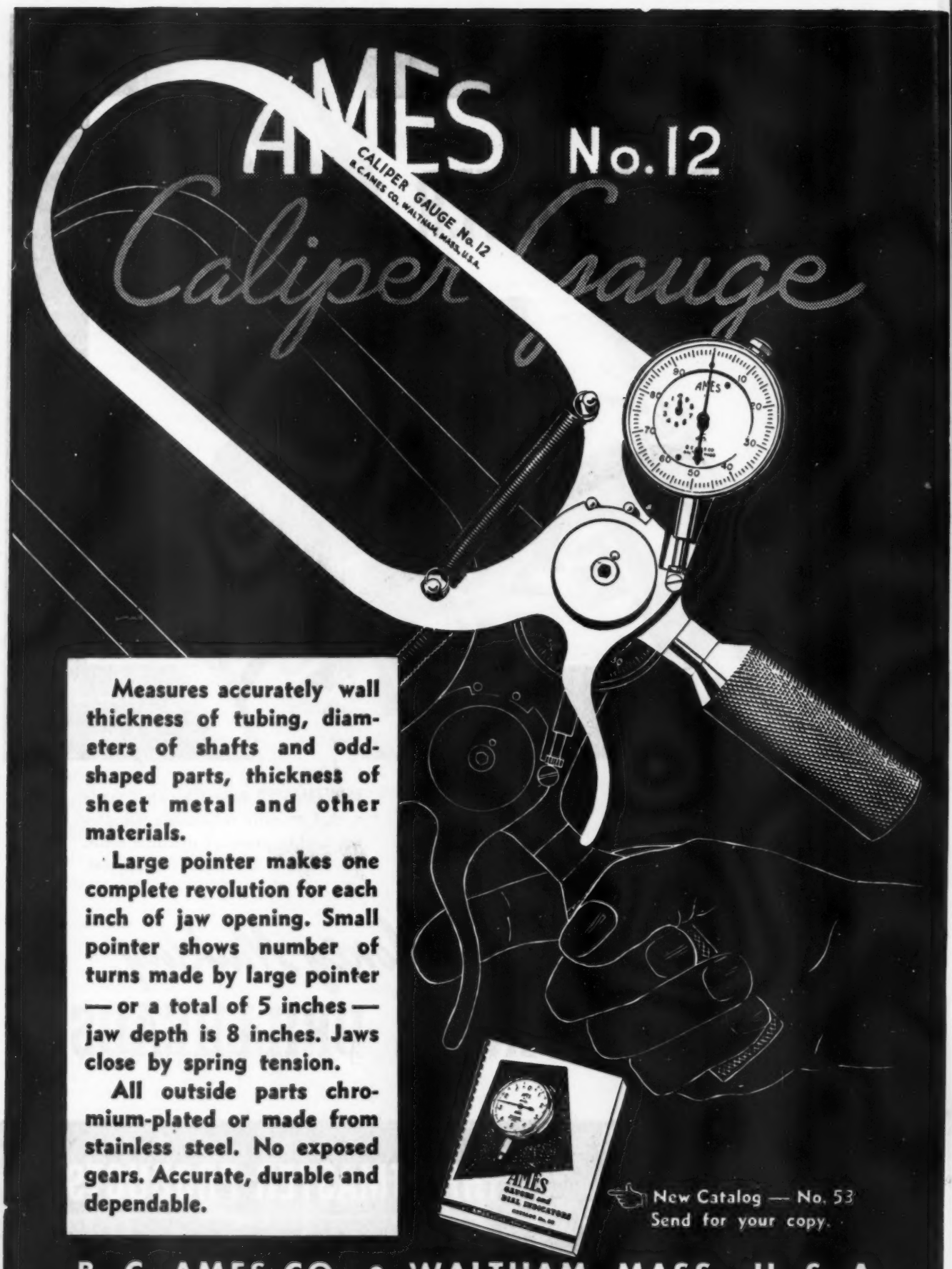

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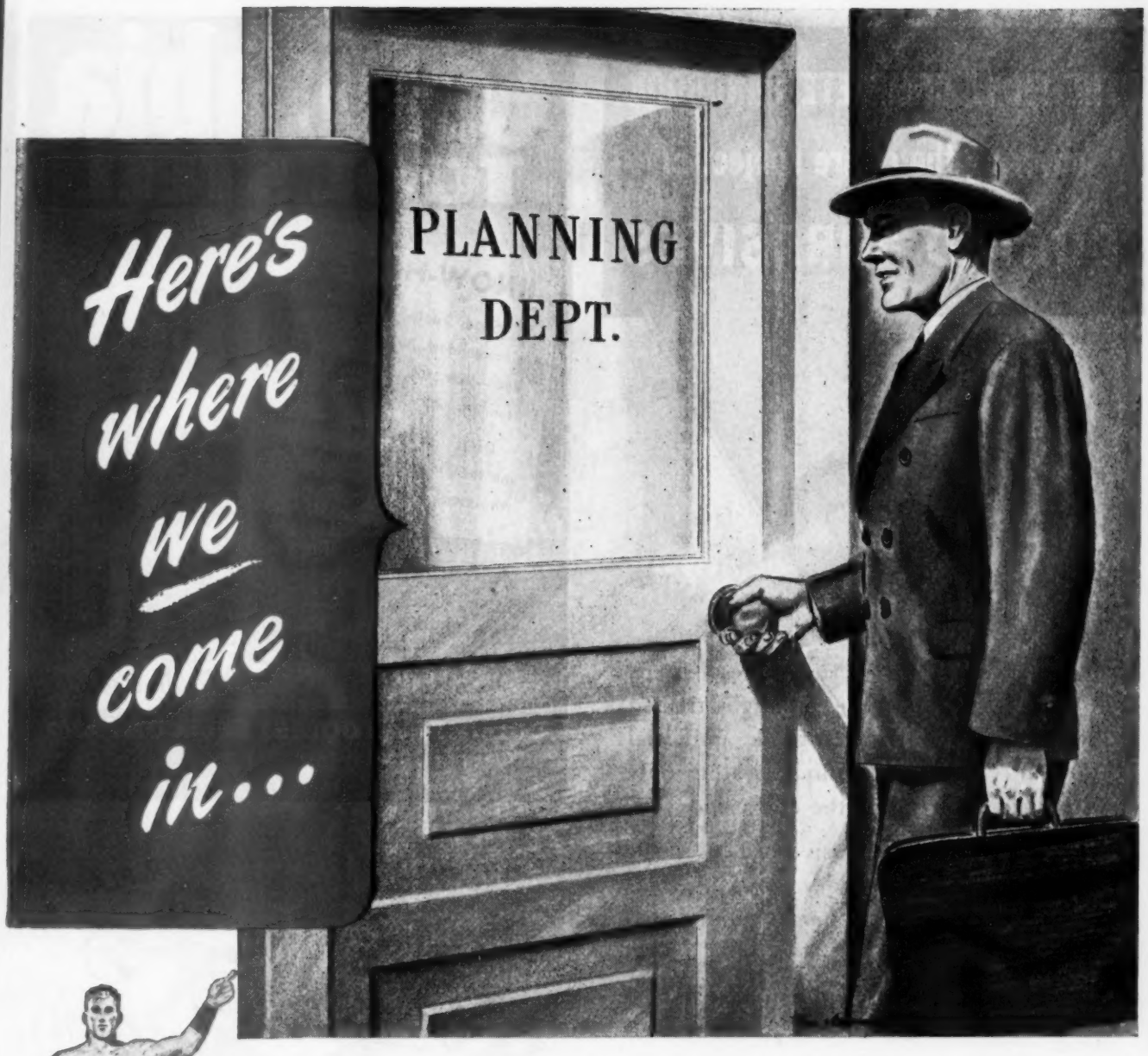

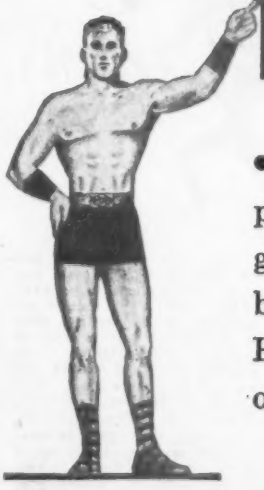

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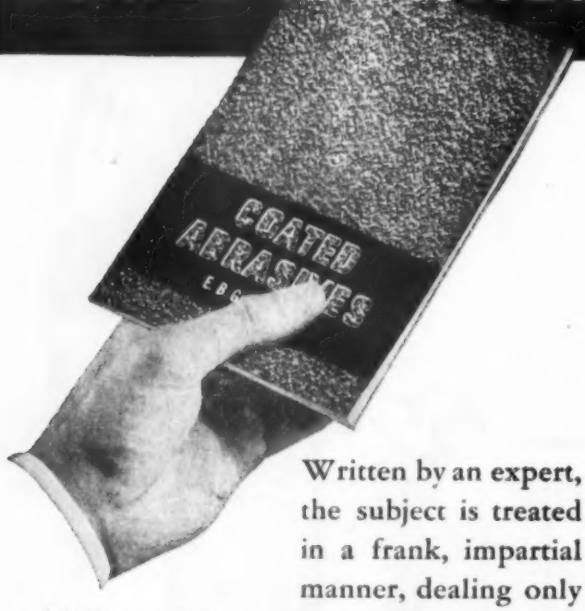

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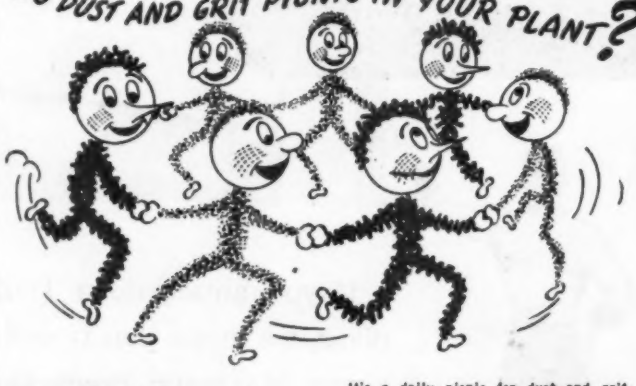

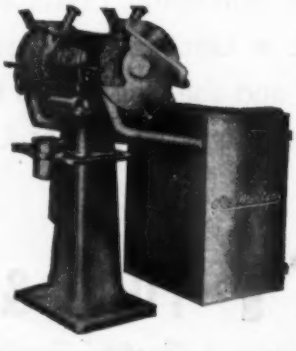

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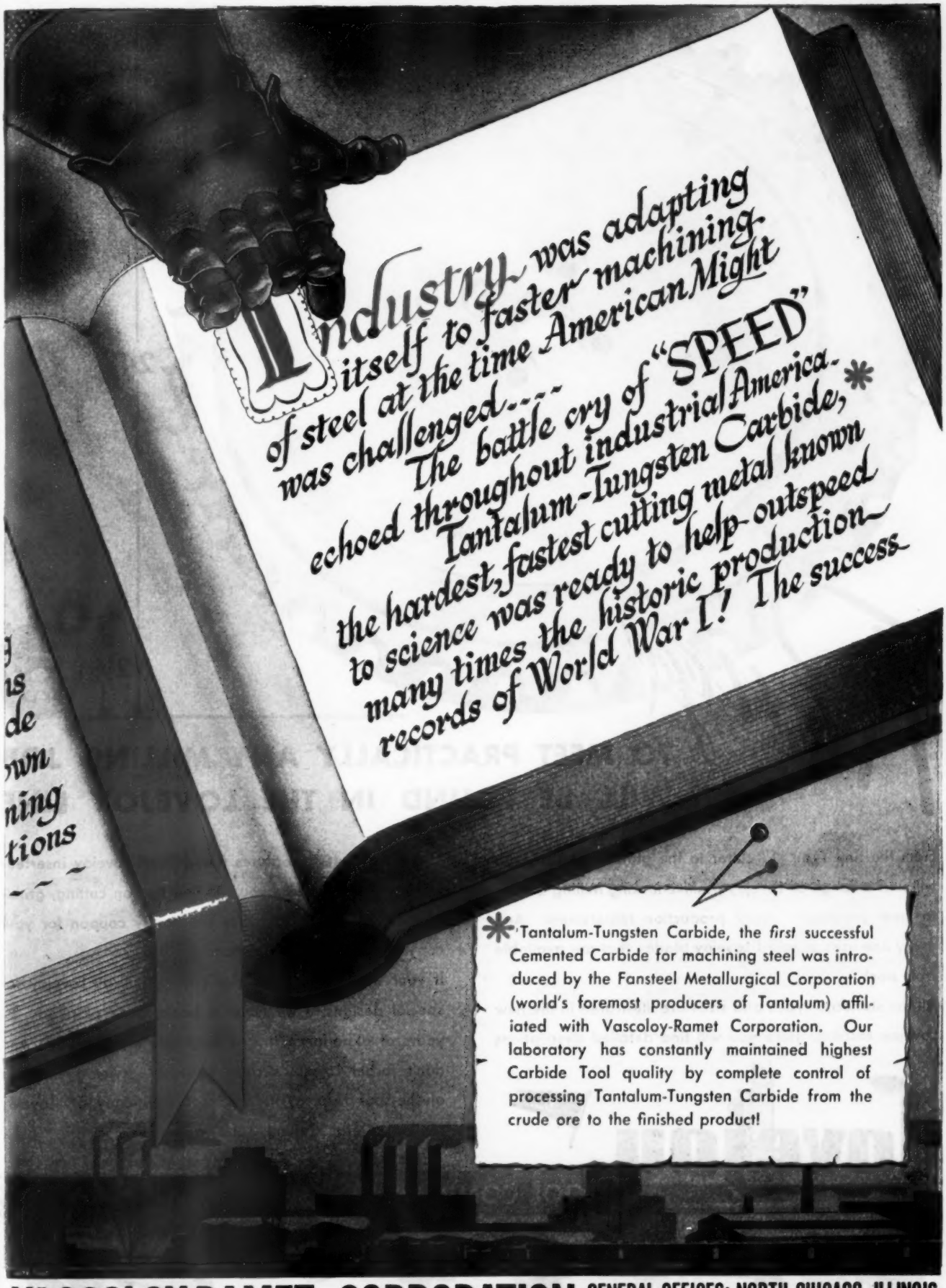
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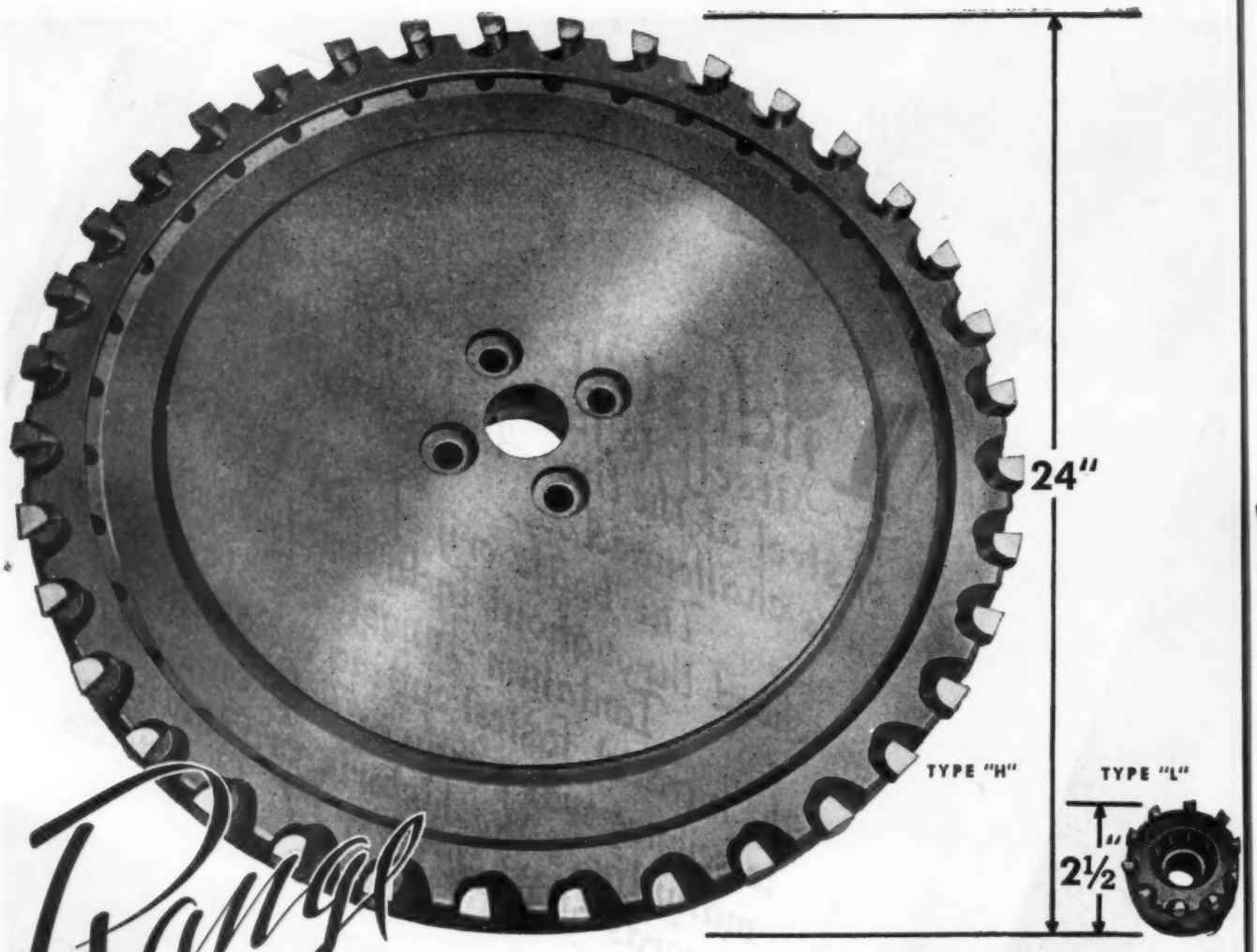

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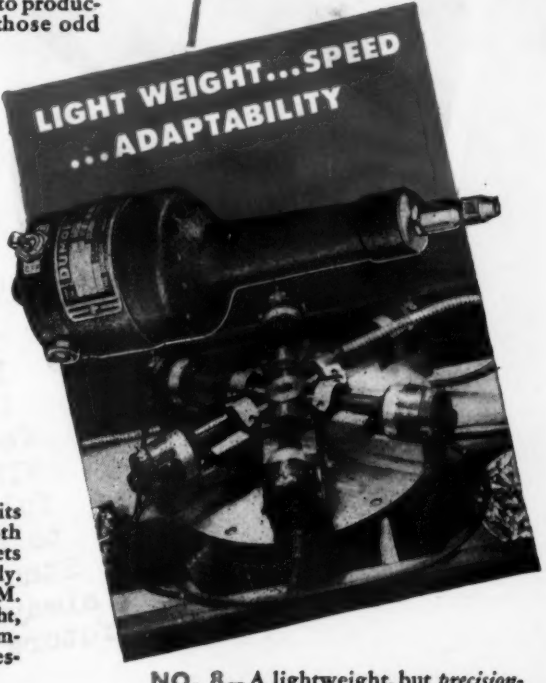

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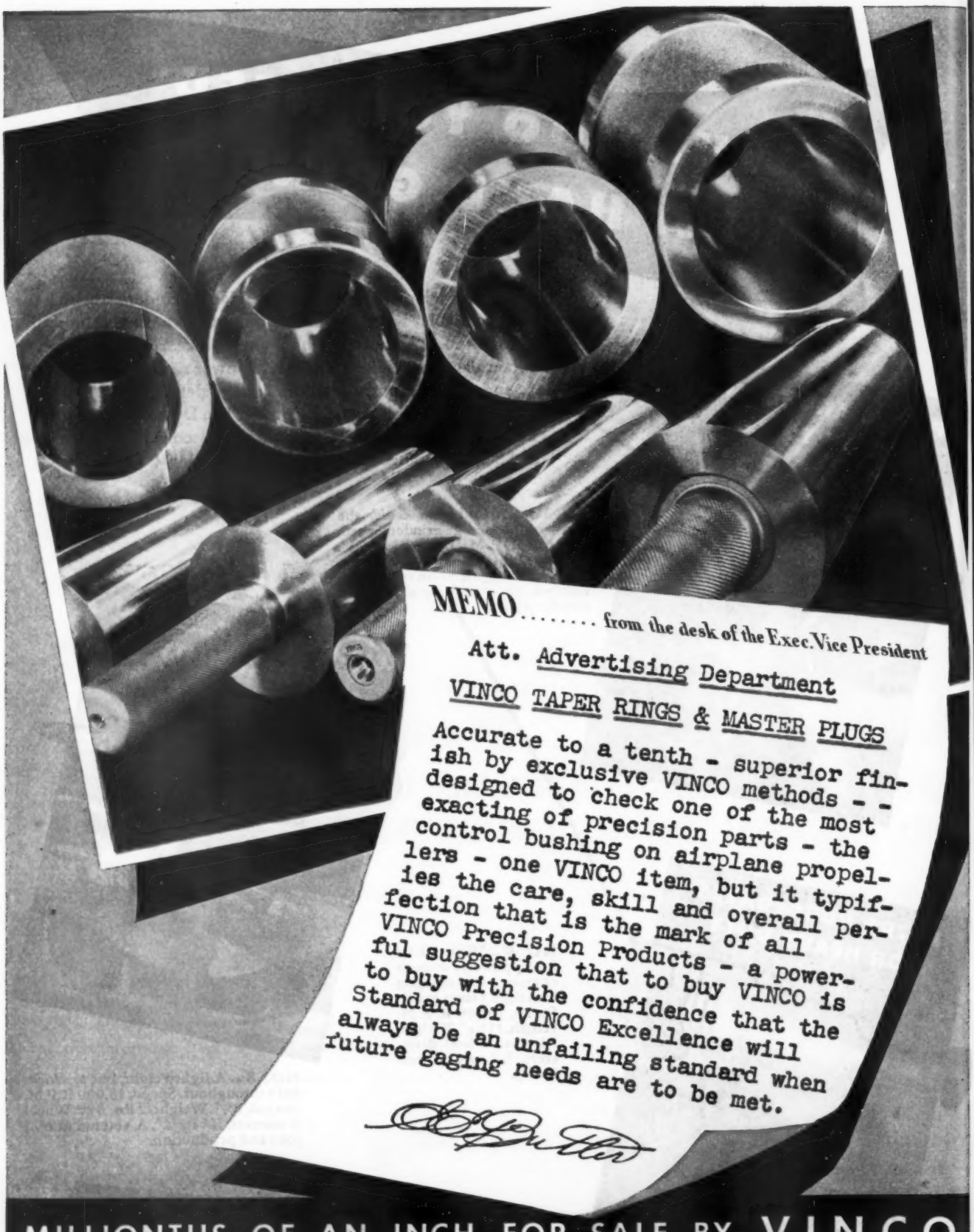
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PALMGREN Heavy Duty Angle Vises are built sturdy and rugged for tough, heavy jobs. They are accurately graduated in degrees, can be quickly adjusted to any angle, stay locked under severe service and save valuable hours otherwise wasted in tedious make-ready, wedging or making temporary jigs and fixtures.

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⅛ to 3 H.P.

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They gained all these advantages:

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- Higher Speeds, Cooler Cutting, Better Finish from
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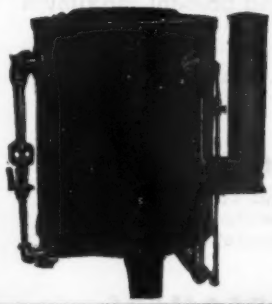

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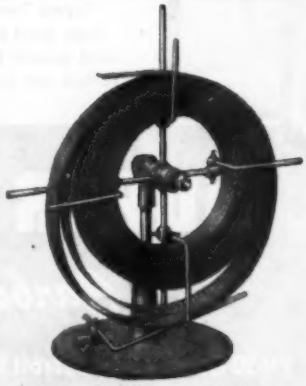

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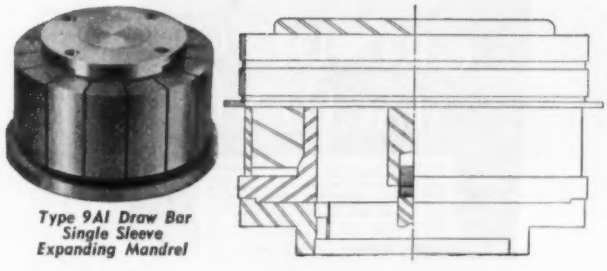
CASE STUDY NO. 1003 ILLUSTRATES SUPERIOR GRIPPING POWER OF ERICKSON MANDREL

In this case, a Gunnite Cylinder Liner with a .346" wall was turned on a lathe with three tools simultaneously taking off .265" of metal at a surface speed of 300 feet per minute and with a .015" feed. Here you see how a positive vise-like grip was delivered without slippage or distortion of the Cylinder Liner under extremely difficult conditions of high speed, a heavy cut, and a heavy feed. Learn at once how this unusual tool can increase production and lower your tool and operating costs.

The Solution: The Erickson Engineering Department developed the mandrel shown below to solve this problem. It delivered .0005" accuracy over an expansion range of .035" and as a result, extremely even grip which eliminated completely the "out of round" condition and the rejects due to scratching of the highly finished I. D. *Total rejects after machining were decreased 100% and production increased 20%.*

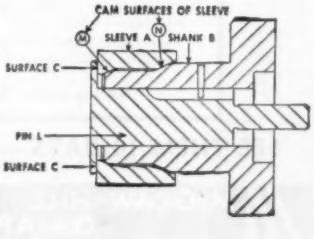


Type 9AI Draw Bar Single Sleeve Expanding Mandrel

Why the Erickson Expanding Mandrel delivers such unusual results

Sleeve A automatically lines up concentrically with axis of Shank B because the two cam surfaces M and N of Sleeve mate within .0001" with cam surfaces of shank.

When Pin L is drawn back against Surface C, Sleeve A aligns with axis of Shank B because of mating of cam surfaces of shank and sleeve. Since sleeve is open-slotted at both ends, Sleeve A expands equally throughout its length to maintain .0005" guaranteed accuracy and a vise-like, even grip.



ERICKSON MANDRELS GIVE YOU

- .0005" Guaranteed Accuracy
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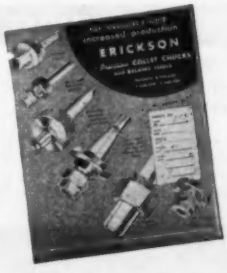
- Interchangeable Sleeves for economy

AT LOWER COST THAN YOU CAN MAKE YOUR OWN



Dept. C of Erickson Tools
2306 Hamilton Avenue, Cleveland, Ohio

Send complete information together with Circular C at once on your Precision Expanding Mandrel.

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Address .....

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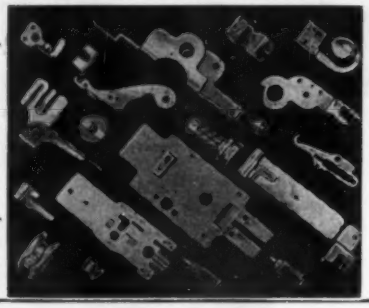

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SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

POSITIONS VACANT

DESIGN ENGINEER—Established Connecticut manufacturer needs graduate engineer or equivalent experienced in design of automatic machinery. Printing press and some tool, jig and fixture experience desired but not essential. Postwar opportunity with company whose products have international distribution. State age, marital status, education, experience, present salary and salary expected. P-352, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MECHANICAL TUBING Executive young or middle-age individual capable of supervising gas weld continuous tube rolling equipment as well as all details concerning hydraulic press bending operation, estimating of automotive exhaust pipe, etc. Give experience, age, past performance and salary expected. Southern Ohio location. P-374, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

OPPORTUNITY: A peace time position is now open for a supervisor of tool and die designing and making apprentices. Desirable qualifications to be considered are college education, natural talent for teaching, actual working experience with machine shop or tool room equipment. This is an excellent opportunity for a married man in early thirties, with initiative, self reliance and a flare for doing things thoroughly, to "grow up" with a new project under the initial direction and guidance of top management. Moderate salary to start, leading to a permanent, responsible and well paying position for the long pull with a medium sized tool shop in business for 22 years. Address P. O. Box 387, Dayton 1, Ohio.

SUPT. THOROUGH knowledge of machines, operation and production procedure. Location Central New York State. Give fully age, experience, references, salary expected. P-384, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS VACANT

WANTED CHIEF Draftsman, radio experience preferred, who is familiar with manufacturing processes involving small stamping, screw machine parts, and assembly operations. Should have knowledge of tools, dies, and fixtures. He should be able to coordinate details and supervise approximately fifty employees. Write, giving age, past experience, with whom, and salary expected. P-383, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ADVERTISING MAN wanted who is thoroughly familiar with trade paper as well as direct mail advertising and catalogue work by machine tool company. Give education, experience, age and salary expected. Information will be treated as strictly confidential. Good opportunity for first class man. P-385, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MACHINISTS MANUFACTURER of shop tools needs machinists, sales and service representatives. Railroad machinists preferred. Salary and expenses. Positions steady. Unusual opportunity. P-386, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED ESTIMATOR—An old, well established tool shop in northern Ohio, desires the services of a man capable of estimating gauges, jigs, fixtures, dies and special machinery. Position permanent. Should you have this ability, write giving full background as to experience, education, draft status and former positions held. Compensation open. Write P-393, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Additional Positions Vacant Ads on pages 290 and 291)

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POSITIONS WANTED

PRODUCTION ENGINEER or Works Manager, 30 years of practical experience in designing and building precision tools for high production, desires permanent position with responsible manufacturer PW-326, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EXECUTIVE—As works mgr., chief engineer or other suitable position. Over 20 years in positions such as works mgr., chief eng., production mgr., chief tool designer, tool supt., ass't chief eng., etc. Have been intimately associated with all phases of engineering and manufacturing and have been in direct charge of planning, methods, processing, tool design, tool making, production and management of manufacturing facilities including all machine tools and equipment. Experienced in small and large quantity production. Size of plant not important but remuneration must be adequate. PW-391, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 290)

SEARCHLIGHT SECTION

POSITIONS WANTED

EXECUTIVE WITH diversified experience in machine work, metal stamping, welding, gray iron casting and assembly. Have been in charge of design and construction of tools, dies, jigs, fixtures and special machinery for the past 8 years. Graduate Mechanical engineer. Age 47. Healthy and very active Machine Tool work, Chief engineer and/or master mechanic position desired. Or what have you to offer PW-375, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

DEVELOPMENT ENGINEER (M.E.) Five years in research department large industrial concern developing new automatic production machinery, additional five years development work on mechanical and hydraulic presses and automatic container machinery. Experienced in supervision and shop methods. Analysis and theory a speciality. Responsibility essential. Age 33. PW-376, American Machinist, 330 W. 42nd St., New York 18, N. Y.

FACTORY MANAGER or Production Executive. Age 44 with 21 years' experience in metal goods manufacturing. Extensive knowledge of production planning, layouts, costs, job evaluations, time study, quality control inspection and personnel management. Jobbing and mass production operations, heat treating, metal finishing, assembly and tool room operation. Have excellent rating for management of division with 3,200 employees and company with 1,500 inspections. PW-377, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATTERNMAKER. GENERAL pattern shop experience 35 years both wood and metal. Estimate costs and lay out work so will produce accurate sound castings from your prints. Capable of taking over shop, train apprentice and produce days work from patternmakers. First class mechanic myself. Can call bluff by doing days work on hard jobs when necessary or working foreman in small shop. Age 51, American, married, two children. Have W.M.C. clearance. State salary in reply. Will go any place. PW-371, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ASSISTANT TO plant or factory manager, age 43, nineteen years' experience in factory costs, estimating, purchasing, production maintenance and labor relations. Detailed information, ability and character references, salary expected upon request. PW-387, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PLANT EXECUTIVE or tool engineer. Twenty-three years diversified manufacturing and executive experience. Thorough knowledge manufacturing procedures, modern production methods, planning and meeting schedules, processing and tool design. Experienced in metal stampings, precision machined and fabricated products, machine tools and general jobbing. Practical tool and diemaker. Age 41. Excellent employee relation record. Technical education. Desires executive position with small or medium size company. PW-388, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

ENGINEER ten years' aviation experience, general airport construction, shop and layout, including mechanical installations. Desires connection with equipment manufacturer supplying airlines and aviation industry. Now employed as consultant. Age 39, excellent character and business reference. PW-389, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SALES ENGINEER—Age 49, experienced in sales, design and manufacture of all types of tooling. 12 years experience with carbide tooling. Has practical shop and sales executive experience. PW-394, American Machinist, 330 W. 42nd St., New York 18, N. Y.

Executive seeks new connection. Good technical and general education, experienced as machinist, toolmaker, tool and machine designer, foreman, superintendent and now chief engineer. Having grown up in the shop, possesses wide experience in tooling, machining and processing, plant layout, and production in the automotive and plastic fields. Used to the coordinated functioning of large organizations. Seventeen years with present employer. Sound reason for seeking new connections. Qualified for position as plant manager or production engineer.

PW-380, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

MACHINE DESIGNERS

Experienced on the design of special machinery. Excellent opportunity for first class men interested in steady positions.

Only men 35-55 with a record of successful achievements will be considered. In replying furnish information preliminary to a conveniently arranged interview.

THE TAFT-PEIRCE MFG. CO.
Woonsocket, R. I.

POSITIONS WANTED

PURCHASING EECUTIVE: with engineering and shop management training. Excellent organizer and supervising of personnel. Long successful record of accomplishment co-ordinating the purchasing and planning depts. of several division for national companies manufacturing heavy precision machinery. Familiar with all the procurement problems involved with modern production. Available after Aug. 15th for key position with an aggressive and responsible manufacturer. Location preference East. PW-390, American Machinist, 330 W. 42nd St., New York 18, N. Y.

REPRESENTATIVE AVAILABLE

HIGHLY RELIABLE engineer, with highest references, wide contacts and experience wishes act as Rome (Italy) representative for American electrical, chemical, machine tool or precision instrument company. Full details in New York. Speaks English. RA-392, American Machinist, 330 W. 42nd St., New York 18, N. Y.

BUSINESS OPPORTUNITY

MACHINE SHOP, well equipped, established many years serving logging, sawmill, and farming area, Western Oregon college town. Columbia Engr. Co., Porter Bldg., Portland 4.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington 5, D. C.

SALESMAN WANTED

SALES AND FIELD ENGINEERING MAN

Factory agent representing nationally known grinding wheel manufacturer needs grinding wheel salesman who must be experienced in servicing and selling direct to steel mills. One with following in Ohio and western Pennsylvania districts will be preferred. Leads and full co-operation will be given—excellent commission arrangement with advances against commission. Write in detail your qualifications. This is a permanent and renumerative opportunity for good man. Address:

SW-381, AMERICAN MACHINIST
520 North Michigan Avenue Chicago 11, Ill.

PROFESSIONAL SERVICES

Contract Termination Specialists
CONSULTANTS, ADVISORS, NEGOTIATORS
We will assume full charge of your TERMINATED WAR CONTRACTS
Govt. Trained—Our charges included in post termination expenses.
ROBERT L. COLLUM ASSOCIATES
Room 837 11 West 42nd St., N. Y., N. Y.

WANTED

INDUSTRIAL CONTROL ENGINEER

We are interested in securing an electrical engineer to develop industrial control apparatus.

Applicant should be familiar with competitive designs, and have working knowledge of tests and working methods. Underwriter's requirements and NEMA standards for electric motor control.

Excellent opportunity to qualify for a permanent supervisory position in Engineering Department of an expanding organization well established in the automotive electrical and magnetic relay field. In applying give age and complete resume of experience.

R-B-M MANUFACTURING CO.
Division Essex Wire Corp.
LOGANSPORT INDIANA

WESTINGHOUSE ELECTRIC CORPORATION

needs two experienced plant planning and materials handling engineers. Adequate salary and assured future for the right man. Wire or write Supervisor, Technical Employment, 306 Fourth Avenue, Pittsburgh, Pennsylvania, for application.

WANTED

MECHANICAL ENGINEER

Large light metal manufacturing concern in New England has an opening for a graduate engineer who has a thorough practical and theoretical knowledge of tool design and production. Must be familiar with hydraulic presses, small stampings and findings. Should be capable of supervising at least 100 skilled employees. Excellent possibilities for advancement. Only qualified persons should apply.

Please state age, education, experience, and salary desired. Permanent post war job.

P-382, American Machinist
330 West 42nd Street, New York 18, N. Y.

WANTED

PRODUCTION MANAGER

Man experienced in planning, scheduling machine loading and inventory control with experience in small lot production. Machine Shop and sheet metal experience an asset. Prefer man looking for post war security rather than salary.

P-335, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED
ENGINEERS—JUNIOR AND SENIOR

Must have thorough knowledge of modern machine tool design practice and must be willing to do board work. Excellent post war opportunities. Please give complete record of your past experience and address your replies to the

Personnel Director, THE CROSS COMPANY,
3250 Bellevue Avenue Detroit 7, Michigan

Auction and Equipment Wanted Advertising—page 298

WANTED

TOOL AND DIE MAKERS—experienced on all types blanking, forming, and progressive dies.

MACHINISTS—with experience in all around machine and tool work, and tool grinding.

HEAT TREATER—with experience on heat treating tools and dies.

Permanent full-time employment with excellent working conditions in one of the South's leading plants. Our company is at present time on vital war work, but we have a splendid postwar future. We will assist in securing living facilities.

KANOY AND SONS MACHINE COMPANY

4111 Thrift Road Charlotte, N. C.

Wanted

DESIGNERS—DRAFTSMEN AND ESTIMATORS FOR PERMANENT POST-WAR POSITIONS

Prefer men experienced in rolled metal products used as bright trim and decorative mouldings for automobiles, refrigerators, washing machines, stoves, etc. No reconversion problems involved. This is an unusual opportunity for men who possess experience, originality and initiative to join a well-established and growing organization, which is considered a leader in its field. Write full details of education, experience and salary expected, and we will arrange an interview for you.

MOULDINGS, INCORPORATED

730 E. Washington St. Indianapolis 2, Indiana

WANTED

MACHINISTS MACHINIST OPERATORS TOOL MAKERS

Permanent full-time employment with America's leading manufacturer of oilfield equipment. Now building vital war materials but has a definite post war future. Living facilities available.

Cardwell Manufacturing Company, Inc.

Box 2001 Wichita, Kansas

WANTED

MECHANICAL ENGINEER

Must be thoroughly experienced in all gear manufacturing problems as well as designing; only those with extensive gear experience need apply. Exceptional post-war opportunity. Write full history including name of university and year graduated; names and addresses of all former employers; age; salary desired.

P-345, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

ENGINEERS MACHINE DEVELOPMENT

Graduate engineer or equivalent, experienced in the design and development of special and experimental machines. Men with creative ability required, experienced in such lines as automatic, semi-automatic, or ordnance equipment. Must be thoroughly acquainted with modern methods and shop practices and capable of developing new ideas in conjunction with modern mechanical laboratory facilities.

State age, marital status, details of education, experience, draft status, present salary and salary expected. Enclose recent photograph or snapshot.

Post-war opportunity.

Applicants must be able to obtain Statement of Availability.

E. I. du Pont de Nemours & Company, Inc.
Personnel Division
Wilmington 98, Delaware

ENGINEER MACHINE DESIGNER TOOL DESIGNER DETAILERS

Cleveland manufacturer requires engineer familiar with the design of machine tools; also man capable of designing and detailing machine and tool parts. Company now engaged in war work, but with definite plans for conversion to certain peacetime products. Reply by letter stating education, experience, qualifications, draft status and salary expected.

P-379, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

ENGINEERS AND DRAFTSMEN

Excellent opportunities for draftsmen and designers on war and postwar precision machine tool work. Permanent openings with excellent prospects for aggressive men. Give full details and salary expected in first letter. Write to:

Personnel Manager
The Heald Machine Company
Worcester 6, Mass.

TOOL DESIGNERS

Should have experience designing Jigs, Fixtures, Stamping Dies, Plastic Molds, Gages, Cutting Tools, etc. on small precision parts. Must be experienced in one or more of the above classifications. Large well established N.E. Ohio manufacturer now fully engaged in vital war work. Excellent postwar opportunities. Living conditions good in small town or near by medium sized city. W.M.C. rules and regulations apply. If qualified address replies to

P-378, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

MASTER MECHANIC

An old, well established organization in New Jersey, near New York City, desires the services of a master mechanic, experienced in all phases of manufacturing aluminum containers, including die making, knowledge of work planning, modern work methods and shop practices, and be capable of assuming supervisory authority. Applicants should state full particulars, such as details of experience, salary expected, references, age and other data of background in letter of application. All correspondence will be treated strictly confidential.

P-365, AMERICAN MACHINIST
330 W. 42nd Street New York 18, N. Y.

DEVELOPMENT ENGINEER

Experienced in designing and direct development of small mechanical devices. Must have creative ability. Knowledge of plastics desirable.

Our company is well established and engaged in mass production of light metal novelties. (Located nearby New York City.)

Age 35-45. Write fully, giving details of experience, education, and salary requirements.

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10x50	14x72	18x96
10x72	14x96	18x120
10x96	16x36	

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HILL-CLARKE MACHINERY CO.

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200 H.P. Hor. 4 Pl. Motor Driven Pump, Capacity 78 G.P.M. 4000#
2300 Volt Synchronous Motor 3 Phase 60 Cycle
ALSO—75 H.P. Hor. 4 Pl. Pump—50 G.P.M.—2000#
50 H.P. Vert. Triplex Pump—24 G.P.M.—2500#
200 H.P. Horizontal 4 Pl. Pump—200 G.P.M.—1500#
18"x15' Accumulator 1500#
500 ton down moving ram hydraulic press 42" stroke, 28" between rods.

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Profiler, #13 P. & W., B.D.
Shapers, 10"-20"-24"-36".
Shaper, 36" Morton, Draw Cut
Straightener, Sheet 42" W-F M.D.

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DRILL—RADIAL—FOSDICK 3¼', G.B., M.D.
KEYSEATER—MITTS & MERRILL No. 6, M.D.
MILLER, PLAIN—MILWAUKEE No. 2-B, Double Over-Arm, M.D.
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AUTOMATICS, Acme 9/16" & 1⅝" Model C 5 spdle., M.D.
AUTOMATICS, Acme 2" Model B 4 spdle., M.D.
AUTOMATICS, Gridley, 9/16", ⅞ & 1¼" Mod. G.
AUTOMATICS, Cone, 1¼ & 1½" 4 spindle, M.D.
AUTOMATICS, Gridley, ¾, 1¼, 1¾, 2¼" & 2⅝" Model F, M.D.
AUTOMATICS, Gridley, 2¼, 3¼, & 5¼" S. S.
AUTOMATICS, Cleveland 1¼, 1½, 2, 3½ & 4¾" Model A, M.D.
AUTOMATICS, Cleveland, ⅞, 1¼, & 2" Mod. B
AUTOMATICS, New Britain #22 and 24 Chuckers
AUTOMATICS, New Britain, ⅝x3¾" & 1x5" M.D., Bar Eqpt.
AUTOMATICS, Potter & Johnston #5a & 6a, M.D.
BORING MILLS, 30" Bullard, M.D.
BORING MILLS, Rockford, 3¾" bar, Horizontal, 24x72" table, M.D. & 2½" Cleveland
DRILLS, High Speed, B. B. 1 to 6 spindles
GEAR HOBBERS, 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #6
GENERATOR, Gleason Spiral Bevel Gear, 10"
GRINDERS, Brown & Sharpe #2 & 3 Universal
GRINDER, Brown & Sharpe #11 Plain, M.D.
GRINDER, Heald #72 Hyd. 2 m.d.
GRINDERS, Bryant #3, 6 & 18 Internal, M.D.
GRINDERS, Rivett #103 Internal, M.D.
GRINDERS, Diamond Surface #2, M.D.
GRINDERS, Landis Hydraulic, 6x18" M.D.
GRINDERS Pratt & Whitney, 12" Vertical Surface, M.D., 9x31" Magnetic Chuck
LATHES, American 14x6' & 20"x8', M.D.
LATHES, Lodge & S, 20"x10' Geared Head, M.D.
MILLING MACHINES, #2 B Hvy. B&S Plain
MILLING MACHINES, Becker Vertical #5 & 6
MILLING MACHINES, #2 B Rockford Universal
PLANER, Gray 30"x30"x8' 2 Rail Heads
PLANER, Ohio 42"x42"x12' One Head, M.D.
PLANER-SHAPER, 30" Cincinnati, M.D.

OTT MACHINERY SALES, INC.
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AUTOMATICS

6—#61 New Britain-Gridley 6 Spindle 1⅝" cap. Automatic Screw Machines. A.C. Motor Drive, Threading Spindle.

1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.

1—#515 National Acme 4-Spindle Automatic.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
#31 Lucas Horizontal Boring Mill, 3" bar.

DRILLING MACHINES

Bickford 4-spindle Rail Drill, #4 Morse Taper. Table 20"x67".
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Woodward & Rogers, 6 spindle.
Fosdick 13", 4 spindle (2). 2 spindle (1).

RADIAL DRILLS

3' 9" col. American, S.P.D.
3' Dreses, 10" rd. col. QCG., M.D.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
6' Arm 14" Col. Cincinnati Bickford.

MULTIPLE DRILL

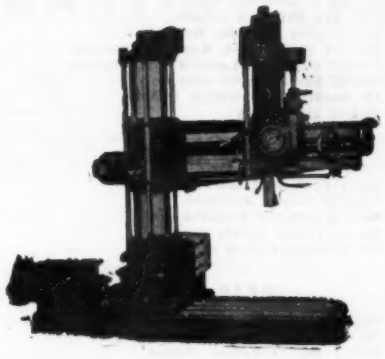
Fox #15H 54 spindle hydraulic feed.

GRINDERS

12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1½" cap.
14"x36" Cincinnati, Plain, motor in base.
6"x32" Norton Cyl., overhead c/s drive.
#2 Brown & Sharpe Surface Grinder.
#70 Heald Internal Grinder.

Blanchard Grinder #16, 30" dia. Magnetic Chuck, 25 HP 3-60-440 V. Motor.

Pratt & Whitney Vertical Surface Grinder, 14"x36" with 10"x36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

LATHES

14 x 6 Pratt & Whitney semi—Q.C.G
16 x 8 Hendey Arranged M.D., Taper.
16" Warner & Swasey Fox Brass (2).
16" Dreses Fox Brass.
20 x 10 Lodge & Shipley, G.H., M.D., Taper.
Putnam, 26 x 12 Heavy Q.C.G., arr. for M.D.
Potter & Johnston #6A Automatic Chuckers; 3½" dia. hole in spindle (2).
14x6 Hendey Toolroom Lathe, G.H., M.D.
14x8 LeBlond Toolroom Lathe, cone drive.

MILLING MACHINES

#3, #4, #5 Cinn., High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller.
#1-#1½-#2 Brown & Sharpe Plain Millers.
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller.
#1-#2—Kempsmith Plain Milling Machines

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x24" N.-B.-P., Planer Shaper, M.D.

POWER PRESS HEADQUARTERS

#4½ Bliss D.C. B.G. Forging 3" stroke.
#1, Bliss-"Stiles", Plain flywheel.
#4 Erdle, Stiles type, 1½" stroke.
#35 Niagara back flywheel, geared.
#22 Wells, back flywheel. Open back.
200 ton A.C.F. Hydraulic Press. Bed 24"x 36", 4-post.
7—25 ton Model SL2 K. R. Wilson hydraulic Presses.
Beck Duplex Embossing Press.
75 ton H.P.M. 2 post, Hydraulic Press.
#1 Bliss Straight Side, double action, Cam Press. Will draw and lift out 2¾".

SHAPERS AND GEAR CUTTERS

15" Potter & Johnson Crank Shaper, universal table.
26" Cincinnati Triple Geared, Belt Dr.
12" Schuchart & Schutte Gear Hobber.
#1 Adams Gear Hobbers, Belt driven (3).
#13 Brown & Sharpe Spur & Bevel Gear Cutter.

SHEARS & METAL CUTTING MACHINERY

Lennox Splitting Shear, ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Niagara #98 Production Power Brake & Folder. 72"x14 ga. cap. Equal to new.
Bliss #232 Slitting Shear, 14 ga.
Gould & Eberhardt Slitting Shear, 10 ga.
Niagara 16 ga. x 42" Gap Foot Shear.
Niagara #9S Power Seamer.
Niagara 4" x 42" Geared Slip Roll Former.
Niagara 3" x 36" Geared Slip Roll Former.
Niagara 48" Roller Leveller. 6 Roll.
Niagara #30 Beader & Flanger.
Niagara #0 Beader.

MISCELLANEOUS

Waterbury-Farrel Cold Header, double stroke, open die, ½" cap. & 6'.

Manville Cold Header, single stroke, solid die, 3/16" cap.

J. C. Miller Co. Lacq. Heater with acquistat.
Heat Treating Furnaces for the tool room.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer, portable, 25 cy. 440 volts.
Hydraulic Pumps—Hele Shaw, Racine, Oil Gear, Motor Driven.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½". New this year.
Standard Automatic Drop Hammer, 300#.

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HORIZONTAL

2½", 4" Binsee
4" Landis Horiz., Floor Type, M.D.

VERTICAL

66", 120" Niles
54" Colburn, M.D., 2 hds.

TURRET LATHES

Foster Nos. 4, 5, 6, 1B, M.D. Univ.
J. & L. 2¼x24", 3¼x36"
Acme 3¼" M.D.

GRINDERS

P. & W. 14", 18", B.B., Vert., M.D.
Blanchard 30", M.D.; Modern 12x48", M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 70, 72A3 Gagematic, M.D.
Norton 50"x28', M.D.
Gardner 72' disc, M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
12" Heald Rotary, Arter 15" M.D.
B. & S. No. 2 Surface, M.D.
Norton 10x36" Hydraulic, M.D.
Badger 24" Dble. Opposed, M.D.
B. & S. No. 10, 11 Cyl.
No. 2 Cincinnati, Centerless, M.D.
B. & S. No. 1, 3 Universal

LATHES

McCabe 26-42"x14'
24x12' Boye & Emmes 3 step cone, B.D.G.
20"x14' Rahn-Larmon, raised to 24"
14x6' Hendey
9" LeBlond Automatic
36x30' Putnam, M.D.
36x22' Putnam S.C.G., D.C.M.D.
32"x35' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M.D.
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS

B. & S. No. 2, 6, 6F Hand Screw
B. & S. No. 00, 0
5 Spdle. Davenport 9/16" cap.
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B 1", 2"
P. & J. 6A, M.D.
⅞" Cone 4 spindle

GEAR CUTTERS

No. 2, 12 Barber-Colman Gear Hobber
B. & S. No. 3-26", 4-36"
Gleason 11" Bevel
G. & E. 60" gear cutter

SHAPERS

24" P. & J.
16", 20", 26", Stockbridge
20", 24" G. & E., M.D.

RADIALS

3', 4', 5', 6', 8' American Triple Purpose
3', 3½', 4' 5' Cincinnati-Bickford
4' Mueller, M.D.; 4', 5' Western, S.P.D.

MILLING MACHINES

10" P. & W. Auto.
No. 3S Cincinnati, S.P.D. rapid trav., M.D.
Nos. 1Y, 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
No. 4 B. & S. Universal
K. & T., B. & S. No. 2, 3 Dbl. overarm
B. & S. No. 2, 3, Vert.
Milwaukee No. 2½ B Vert.
Kempsmith No. 1 Univ.

MISCELLANEOUS

Gorton No. 1S Engraving Machine
6 spindle Avey Drill, 15" overhang
McCabe ½" Flanger
Rochester No. 5½ B Hammer
Baker #2 Keyseater 5 P.D.
Pels 6" Vert. Shaper
Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
#7 Burr Keyseater
Natco No. 13 Multiple Spindle Drill
48" Southwork gate shear ⅛" 24" gap.
8'x¼" cap. Kling Bending Rolls
6' Hilles & Jones Roll
9J Gorton Vert. Miller

AARON MACHINERY CO.

MONA MEMBER

45 Crosby St.
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GOOD MACHINE TOOLS

AUTOMATICS

⅞" and 2" Cleveland Model B
1⅝" New Britain 6 spindle
4½" Gridley 4-spindle Model H
No. 454 New Britain, 4-spindle chucking
6"x6¾" Gess & DeLeeuw 4 spdl. chucking
14"x19" Fay automatic lathe
15" Sundstrand Automatic lathe
Gisholt Simplimatic

BROACHES

No. 1 Foote Burt hydraulic surface
Twin 10 Oilgear hydraulic
No. 2S Lapointe hydraulic
No. 3 Lapointe double screw
No. 2 Standard screw press

GEAR CUTTERS

No. 12 Barber-Colman hobbers
No. 12 Bar. Col. long bed splining
Nos. 7 and Z1 Fellows shapers
Nos. 18H & 16HS Gould & Eberhardt hobbers
No. 1 Lees Bradner hobbers
64"x30" G & E spur gear cutter
36"x6" G & E spur gear cutter
No. 36 BM Gould Eber. 3 spdl. bevel
11" Gleason straight bevel, segments & Gears
13" Gleason spiral bevel pinion and gear roughers
18" Gleason bevel testers and lappers
8" Red Ring spur gear lapper
Cimatool "Peerless" gear chamferers
Lipe 2-spindle gear chamferer
14" No. 5A Lees Bradner gear generator

GRINDERS

No. 2 Cincinnati centerless
No. 72A3 Heald Sizematic
No. 1 G Grenby Internal
No. 75 Heald Internal
Heald No. 72 automatic electric sizing internal
12"x36", 16"x36" & 18"x72" Landis
6"x20", No. 10 & 6"x32" No. 11 B.&S.
Nos. 1 & 2 Brown & Sharpe Universal
10"x18", 10"x36" & 10"x50" Norton
10"x36" Bath No. 2½ Universal
18", No. 6 Besly opposed disc
20" Gardner semi-automatic disc grinder
Ingersoll face milling cutter grinder, type EN85
Cincinnati face milling cutter grinder
Sellers and Gisholt tool grinders
16"x32" & 16"x72" Landis crankpin
No. 10 Blanchard surface
No. 1½ Cincinnati tool & cutter

LATHES

12"x6' Sebastian
14"x6' Mulliner
18"x8' Boye & Emmes
28", No. 3B Foster turret
28" Gisholt turret
8" and 12" Sundstrand Stub
15" Sundstrand automatic stub
14"x18" Monarch Magnamatic
9"x12" Sundstrand grd. hd. Mfg.
42" Bullard New Era U.T.L.

MILLS MISCELLANEOUS

2½" & 3½" bar Universal horizontal mills
5" Barret cylinder borer
No. 3-B Milwaukee vertical miller
No. 3 Reed Prentice vert. miller & die sinker
No. 2 Cincinnati plain
No. 4—36 Cincinnati Hydromatic
No. 3 Sundstrand bed type mfg. miller
48" Oesterlein tilted offset miller
30" & 42" Ingersoll continuous rotary
Type C Hall planetary thread miller
30" and 48" Newton cont. rotary
No. 4 Lees Bradner univ. thread
4" Rice Barton double spline
No. 6 Whitney hand mill
No. 2 Kent Owens hand
96" Ingersoll Rotary type
48"x21"x22' Ingersoll double column slab mill, spindles front & rear
22"x22"x28' Ingersoll as above.
26"x21"x22' Ingersoll as above

SEND FOR COMPLETE LIST

MILES MACHINERY CO.

SAGINAW, MICHIGAN

Ready For Shipment

AUTOMATICS:

B & S #00, #0 & #2
Gridley 3¼", 4½" 1 sp.
Potter & Johnston #6C Chuckers
Gess & Deleeuw Chucker
Cone 3½" Cap. 4 spindle
Cleveland 6¾" Model A

BORING MILLS:

Cleveland 2½" Bar Horiz.
Bullard 30" Vert. Turret
Bertram 42" Vertical
Bullard 61" Maximill
Bullard 100"—2 Head—M.D.

DRILLS:

N-B-P 5' & 6' & 7' Radial, Motor on Arm
Niles 7' Radial
Cincinnati-Bickford 6' Radial
Pratt & Whitney Gun Barrel Drills & Rifles

GEAR CUTTERS:

Brown & Sharpe #3—26"
Fellows #64
Fellows Gear Burnisher
Gleason 6" Generator

GRINDERS:

Cincinnati #2 & #3 Centerless
Baxter D. Whitney #23 Cylinder Grinder, Like New
Brown & Sharpe #11 Plain
Grenby Internal
Heald #70-A Internal
Blanchard #16-26" M.D.
Norton 15"x15"x72" Surface
Sav-Way Internal
Brown & Sharpe #3 Univ.
Bath 10"x25" Univ.
Cincinnati 12"x36" Univ.
Landis 20"x120", 20"x144" Plain Grinders
Cincinnati #1½ Tool & Cutter
Pfauter Hob Grinder
Bryant #3B, 6, 12, 18 Internal
P & W 14" B.B. Vert. Surface, Model B
Farrel Roll Grinder

LATHES:

Monarch 14"x6'
LeBlond 14x6'
Sidney 17"x8'
Lodge & Shipley 20"x8'—G.H.
J & L 2¼ x 24 & 3 x 36 Turret
B & O 3" Cap. G.H.
Warner & Swasey #2A & #3A.

MILLERS:

Cincinnati #0-B Plain
Sundstrand #3, New 1940
Milwaukee Simplex
Cincinnati #5 Plain SPD
LeBlond #3GH—Plain
Rice-Barton Spline Millers
Becker #4B Vertical
Cincinnati #3, #4 Vertical SPD
B&S #3 Vertical SPD
Becker Model C, Vert.
Waltham Bench Thread Miller
Rowbottom Cam Miller
P & W 5", 12" Automatic
Pratt & Whitney 2" Spline Duplex
Cincinnati 12" B.G. Mfg. Becker #7H Lincoln
Potter & Johnston #2M Prod.

MISCELLANEOUS:

Boring Machine—Coulter Diamond Borer
Chambering Machine—Pratt & Whitney
Chucking Machines—Potter & Johnston #6-C
Header—W-F ¾" Ball
Header—W-F #1 & #2—SSSD
Shaper—P & W 6" Vertical
Shear—Marshalltown #88 Rotary Bevel, M.D.
Tapper—Threadnut #2
Threader—Manville #3 Auto. Duplex Bolt Thread Cutting machine, Hopper Feed, M.D.
Swager—Dayton #3½
Upsetter—Acme 2" Steel

PLANERS:

American 30"x30"x14'—2 Head
Cincinnati 48"x48"x20', 3 Head
Gray 84"x72"x18', 4 Head

PRESSES:

W-F 20 Ton Rack & Pinion
Robertson 170 Ton Hyd. 10' High

BOTWINIK BROTHERS, INC.

373 Welton St., New Haven 9, Conn.

EASTERN OFFERS FROM STOCK LATEST TYPE MACHINES IN PRACTICALLY NEW CONDITION

MILLING MACHINES

No. 5 Cincinnati Plain High Power, motor drive
No. 4K Milwaukee Universal, motor drive in base, equipped with 14" Hypoid Dividing Head, National Standard Spindle
No. 4K Milwaukee Plain, motor drive in base, National Standard Spindle
No. 3K Milwaukee Plain, motor drive in base, National Standard Spindle
No. 4 Cincinnati Dial Type Vertical, motor drive in base, National Standard Spindle
No. 2M Cincinnati Vertical, motor drive, power feed rotary table, National Standard Spindle (3)
No. 5 Reed-Prentice Vertical, motor drive

RADIAL DRILLS

6' - 17" column Cincinnati-Bickford, latest type
6' - 17" column diameter American Hole Wizard Radial Drill, with 15 H.P. motor drive, plain box table, cutting lubricant system, splash guards
Two 6' - 17" column diameter American Hole Wizard Radial Drills, with 15 H.P. motor drive, railroad type motor driven base

MANUFACTURING TYPE MILLING MACHINES

Three No. 34-36 Cincinnati Duplex Hydromatic Milling Machines, motor drive in base, equipped with tracer control on each head
No. 1-8 Kent-Owens Hydraulic Milling Machine, motor drive
No. 4-36 Cincinnati Plain Hydromatic Milling Machine, motor drive
No. 000 Brown & Sharpe Plain Milling Machine, motor drive
No. 0-8 Cincinnati Plain Automatic Horizontal Milling Machine, model EA, with rise and fall spindle carrier, motor drive
No. 4—48" Cincinnati Plain Hydromatic, m.d., latest type

BROACHING MACHINES

No. VAS-5-42 Colonial Single Ram Hydraulic Broach, motor drive, capacity 5 tons normal pull, 16,800 lbs. peak, 42" stroke, 30' per minute cutting speed
No. 75 H.P. LaPointe Hydraulic Broach, capacity normal pull 37½ tons, maximum stroke 150", cutting speed variable 2 to 17' per minute, return speed constant 20' per minute. Maximum stroke 150". Capacity hydraulic system 150 gallons. Equipped with an assortment of broaches

ENGINE LATHES

36"x36'6" (28' centers) Niles Heavy Duty, motor drive thru 24 speed head, equipped with two carriages, with separate motor driven power rapid traverse to each carriage. Lathe is equipped with large internal geared face plate with chuck jaws and regular equipment, including motors and control
36"x28'6" bed (20' centers) Niles Heavy Duty Engine Lathe, motor drive as above, except has one carriage only. Also equipped with taper attachment
36"x28'6" bed (20' centers) Niles Heavy Duty Engine Lathe, same as above, except without taper attachment
30"x28' bed (20' centers) Niles "Time Saver" Engine Lathe, motor drive thru 12 speed head, complete with electrical equipment, power rapid traverse to the carriage, regular equipment, also cutting oil attachment and pan
22"x16' centers (22' bed) American 100 H.P. Input Super Lathe, arranged for variable speed motor drive thru geared head and equipped with 100 H.P. D.C. motor, power rapid traverse, chip breaker, chip conveyor, 5 motors
10"x3½' bed South Bend 1" Collet Capacity Motor Driven Bench Lathes
10"x20" Pratt & Whitney Bench Lathe, motor drive
17"x124" centers LeBlond Rapid Production Geared Head Lathe, motor drive in base
3—18x96" Monarch, m.d. in base, hardened ways, taper attachment, latest type

GRINDERS

No. 500—170" Hanchett Surface Grinder, motor drive
10x36" Cincinnati Model EA Plain Hydraulic Grinder, motor drive
10x48" Landis Type C Plain Hydraulic Grinder, motor drive (2)
14x48" Cincinnati Plain Self-Contained Cylindrical Grinder, motor drive (2)
16"x216" Landis Type B Plain Hydraulic Grinder, motor drive, with D.C. motors
No. 16—22" Bryant Hydraulic Hole Grinder, motor drive, with A.C. motors

MISCELLANEOUS

6 spindle ½" Acme Semi-Automatic Nut Tapper, motor drive
No. 12M Morey 2 Spindle Profiler, motor drive
No. 1 Leighton Type Straightening Machine
No. 2 Cincinnati Acme Universal Turret Lathe, m.d. in base, latest type
No. 5 Cincinnati Acme Full Universal Turret Lathe, m.d. in base, latest type

More than 1,000 machines in stock for immediate shipment

Every machine listed is in our Cincinnati Warehouse. Tel. MElrose 1241
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MOREY
Dependable Used Machines

BORING MILLS—VERT.
BULLARD 24"—M.D.
GISHOLT 42"—2 head

DRILLS—RADIAL
AMERICAN 3' Triple Purpose—Mtr. on arm
CINCINNATI BICKFORD 3½'—M.D.

GEAR GENERATORS
GLEASON 3" and 6"—Straight
GLEASON 10" and 15"—Spiral
GLEASON 12"—Straight

GRINDERS
NORTON 24"x240" Plain
ARTER 8" Rotary Surface
ARTER Automatic Piston Ring
UNIVERSAL Hydraulic Spline Shaft

LATHES—Engine & Turret
LODGE & SHIPLEY 30"x26'—2 carriages
MOREY #3 Univ. Turret—1½" cap.
WARNER & SWASEY #3A Univ. Turret

MILLERS
BROWN & SHARPE #3A Universal
KEARNEY & TRECKER #3B Universal
CINCINNATI #3 Vertical
BROWN & SHARPE #3 Vertical
MOREY #12M—2 spindle Vert. Miller and Profiler
MOREY 12" x 60" Thread Miller
RICE BARTON 4" Duplex Spline Miller
INGERSOLL 48"x48"x16' Adj. Rail—4 swivel heads

PLANERS
GRAY 30" x 30" x 8'—1 head
CINCINNATI 36"x36"x10'—4 heads
GRAY 72"x48"x12'—2 heads
WOODWARD & POWELL 60"x60"x20'—4 hd.

SHAPERS—HORIZ. and VERT.
MOREY 8" and 12" Vertical
PRATT & WHITNEY 6" and 10" Vertical
MORTON 30" Draw Cut—Horizontal
MORTON 60" Stroke Shaping, Planing & Boring Machine—M.D.

MISCELLANEOUS
NATCO D5 Multi-Driller—M.D.—Late Type—10 Spdles.—¼" cap.
DILL 18" Slotter
ESPEN LUCAS #138 Cold Saw—12" cap.
SAUNDERS 8-18" Pipe Machine
TREADWELL 12" Pipe Machine

MOREY
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410 BROOME ST., NEW YORK

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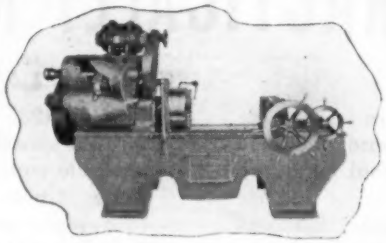

1—Landis 4" sin. Hed. Thread. Machine, mech. speed changes, lead screw attmt. grd. for 4 pitch thread, stan. use, bolt grip, auto. opening and closing attmt. for die hed., 7½ h.p., A.C. elec. equip., 440, 3 phase, and starting equip., 1942 vintage.

1—Waltham Thread Miller, mtzd., taper attm't., relieving attm't., change grs., extra cutter head, excel. condition.

4—P. & W. Thread Millers, 4½x12, 6x48, 6x90, 6x132.

1—Hanson-Whitney 8"x10" Univ. Thread Miller, 220—3 phase 60 cycle, elec. equip., right hand ext. lead cams, 1942 vint., used very little. Inquire for complete details.

2—Milwaukee No. 1½B Pl. Milling Mach. fcty. mtzd., dbl. overarm, feeds in all directions, tbl. feed 30" cross 10", vert. 18½", wk. sur. tbl. 45½"x11½", no. speed changes 18, range of speeds rpm. 15-54, wght. 3000 lbs.

3—Niles No. 72, 4½" Duplex Control Horz. Boring, Drilling and Milling Machine, M.D., Excel. condition.

1—Univ. 3½" Knee Type Boring Mill, 3½" bar, No. 6 Morse Taper, size of tbl. 30"x48".

2—2 M Horz. Auto. Potter & Johnson, Dual Tbl. Milling Machines, 12 changes spin. speed, 16 changes tbl. feeds, tb. wkg. surf. 37"x12½", oil pan 43"x12½".

1—Amer. Tool Works Co. 24"x25' bed. grd. hed, M.D. Engine Lathe, pan bed, with extra carriage for boring attmt. with rapid trav., dist. betw. centers 21'. Excellent condition. Priced right. Write for complete information and picture.

1—16"x6'x12 Lathe speed grd. hed., L. & S., M.D. pan bed, serial No. 27146 with mfg. stops, sw. 19", dis. btw. cens. 30".

1—Flather 16"x8' Lathe, QCG, dist. betw. centers 52", M.D.

1—Rahn Larmon 18"x8' Lathe, db. back grd., dis. btw. cens., M.D.

1—Bridgeford Machine Tool Co. 48"x59' Overall Boring Lathe, 9 spin. speeds, lead screw type with single carriage and steady rests, M.D. Can be used for turning.

1—LeBlond Lathe, 21", swing Heavy Duty, db. bk. grd. Auto Lathe, Dis. betw. cens. 39", pan bed, m.d.

Botwinik Brothers
of Mass. Inc.
3 SHERMAN ST., WORCESTER 1, MASS.

SELECTED IN-STOCK OFFERINGS *from "UNITED"*

1—Jones & Lamson 2¼"x24" Turret Lathe, Steel Head, Bar Feed, Tooling.
2—Hendey Geared Head Engine Lathes, 18"x10', M.D. (1 with Taper).
1—Prentice Bros. Geared Head Lathe, 24"x18', arr. for M.D.
1—F. E. Reed 16"x18' LCG Compound Lathe
1—Peerless Shaping Saw, 6x6, arr. for M.D.
1—18" Ball Bearing Double End Disc Grinder with Adj. Tables, 5 HP., 3/60/220 (new 1943).
2—3-Spindle Acme Bolt Threaders, 1" cap., one with lead screw.
1—Pratt & Whitney Single-Spindle Profiler, gear driven.
1—Henry & Wright Class C 4-Spindle Drill, #2 Taper
1—Henry & Wright Class K Single-Spindle Drill, #2 Taper.
1—Francis Reed Drill, Single-Spindle, #2 Taper
1—Cincinnati #2M Plain Milling Machine
2—Morey #2G Turret Lathes, P.F., Geared, M.D. (New 1942)
1—American 3' Radial Drill, M.D.
1—Foster #4 Turret Lathe, P.F.
1—Lamb & Nash 36", 14-gauge Gang Slitter with several High Speed Cutters.
1—Cincinnati 24" Duplex Miller, #50 Taper, Arr. for M.D., Excel. Cond.

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Send us a list of YOUR SURPLUS EQUIPMENT!

UNITED MACHINERY & TOOL CORPORATION
442 Pleasant St., Worcester 2, Mass.

RADIALS
3', 4', 5', 6, 8'
AMERICAN TRIPLE PURPOSE

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N.Y.

Boring Mill, 24" Bullard, "New Era."
Boring Mill, 60" Niles, 2-Hds., MD.
Grinder, Univ. # B&S., Int. Att., C/S.
Grinder, Rotary, 10" Walker; 16" Heald.
Lathe, 14"x6' Rockford, QCG; Dr-In Att., Cks.
Lathe, 28"x14' Boye & Emmes, QCG; 2⅛" HS.
Miller, Univ. #3B. Milw. Vert. Att., SPD.
Miller Production, #33 Kempsmith, SPD.
Nibbler, 3-B. Campbell, 34"x⅜", SPD.
Shaper, 14" G.&E., B.G. Crank, V-ram., vise.
Sprue Cutter, Tessmer, 1½" Cutter, MD.
Turret Lathe, 26"x7½" Libby-Int., MD.
Welder, Spot, 10 KW. 60 cy. 220 V., 18" tht.

Partial List.

GALBREATH MACHINERY CO.
Empire Building Pittsburgh, Pa.

54"x34' Houston, Stanwood & Gamble Engine Lathe, two carriages, two Taper Attachments, 30 hp motor.

8"x48" Jones & Lamson Automatic Thread Grinder, 1940

6"x15" Jones & Lamson External Thread Grinder, 1940

12" Gleason Straight Bevel Gear Generator, 1940

2-L Gisholt Universal Turret Lathe

#2 Cincinnati Centerless Grinder, 1940

All latest type machines.
Many more. Send us your inquiries.

HAZARD BROWNELL
Machine Tools
350 Waterman St., Providence 6, R.I.
Dexter 8880

4" Bar Lucas Horizontal Boring Mill, M.D.
5" Bar Newark Horizontal Boring Mill, 8' Bed, M.D., $2250.00
16x96 Landis External Grinder, self contained
#17 Barber Colman Heavy Duty Gear Hobber, can take a hob up to 5¾" dia., M.D., $4800.00
16" 8-sp. Bullard Mult-Au-Matics, 2 yrs. old
B & S Surface Grinders 2 yrs. old
#40 Cross Gear Tooth Rounder, M.D.
#3, #4 Horiz. and Univ. Milling Machines, M.D., $1750.00 & $2500.00
4—#4½ Bliss Presses, 2 yrs. old, 100 ton cap.

PAUL'S MOTOR AND MACHINERY SUPPLY CO.
MONA MOTORS
6111 Vermont Ave.
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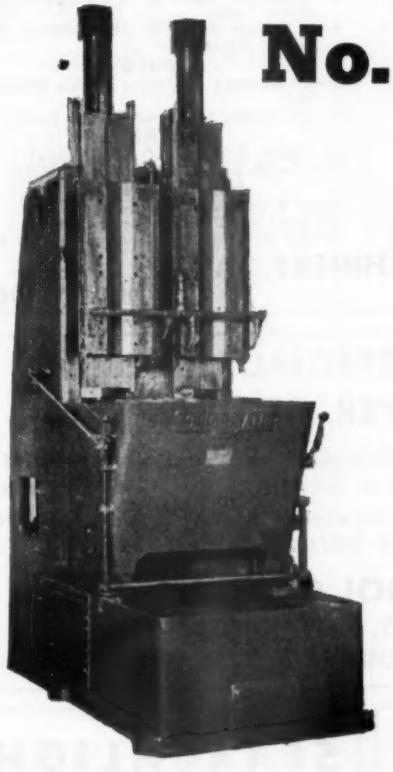
Reed Prentice 27"x18' Bed Quick Change Gear, 12-Speed Geared Head Engine Lathe —Taper Attachment. 10 H.P. 3/60/20 Motor with "V" Belt Drive.
Raising blocks to swing 40"

H. J. KOONTZ
PHONE 8180 MASSILLON, OHIO

UNUSUAL VALUES

Blueprint machine—3 pieces
Brake, Robinson 5' toggle
Drill, high speed 7' over hang single spindle
Drill, two-spindle sensitive, #1 Morse taper
Drill, 4-spindle sensitive
Gear cutter, Brown & Sharpe #3—26
Gear cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive.
Hammer, 50# Bradley upright helve.
Two 18"x8' **Mueller lathes**, H.S. quick change gear
One 16"x6' **Hendey Lathe.**
Pipe Machine, 8" Oster motor drive
Planer 24"x24"x8' **Pease**, motor drive
Punch & Shear two ½" & ⅝" capacity
Shaper 24" Gould & Eberhardt
Shaper, 16" Barker
Threading Machine #0 Webster & Perks
Tool Grinder Sellers new #0, #1 and #2 magic chuck and collets

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO



No. 5-54 CINCINNATI

Vertical Hydraulic Duplex Surface

HYDRO-BROACH

Maximum stroke in inches 54"

Hydraulic ram movement

Maximum broach length 50"

Broaching force for which tools should be designed 10,000 lbs.

Ram speed, 31' per minute

Equipped with horizontal work table of indexing type

Equipped with coolant pump, ½ H.P., 3 phase, 60 cycle, 220/440 Volt Master Electric motor

Hydraulic pump driven by 20 H.P. U.S. Motor, 3 phase, 60 cycle, 220/440 Volt, 1000 R.P.M. and starter

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LARGE LATHES

30"x26' Lodge & Shipley 12 speed Geared Head, M.D.
32"x35' Wickes Grd. Hd., M.D.
36"x30' Putnam Grd. Hd., M.D.
42"x16' Putnam, M.D.
36"x22' Putnam Geared D.C. M.D.

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45 CROSBY STREET - NEW YORK, N.Y.

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders

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6' American Plain Radial Drill, M.D.
#3 Cincinnati Vertical Milling Machine H.P.
38"-44" Niles-Bement-Pond Vertical Boring Mill M.D.

HEAVY DUTY MACHINE TOOLS

52" Bullard Vertical Boring & Turning Mill.
6' Cincinnati Bickford Plain Radial Drill.
7' Cincinnati Bickford Plain Radial Drill.
7' American Triple Purpose, Motor on arm.
27"x16' Lodge & Shipley Grd. Hd. Tapers.
30"x14' Schumacher & Boye Lathe, Q.C.
10' Cincinnati Heavy Duty Boring Mill, M.D.
12' Niles-Bement-Pond Heavy Duty Boring Mill, M.D.

GRINDERS

12"x96" Landis Plain, S.C.
18"x85" Landis Plain Self contained.
#78 Covel Hanchett Surface.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#1 Adams Gear Hobbers.
#1 Schuchart & Schutte Gear Hobber.
#3 Adams Farwell Gear Hobber.
#61 Fellows Gear Shaper, Cone drive.

PLANERS

96"x96"x36' Cincinnati 4 Hds. M.D.
48"x60"x26' American 4 Heads.
30"x30"x8' Gray Planer.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St., Cincinnati, Ohio

No. 2B Brown & Sharpe Mill, M.D.
16"x8' Hendey Lathe

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FOR BETTER USED MACHINERY— See REYNOLDS!

3—#25 Foote-Burte Heavy Duty Upright Drills
1—#21 Brown & Sharpe Plain Automatic Miller
1—39"x19' Pond Engine Lathe; 12' c-c
1—Vertical Slotter—Logansport Hydraulic; motor driven; new 1941.
2—Krueger Horizontal Deep Hole Drills; capacity 1"x16"; M. D.; has Barnes Head; new 1940
1—10"x36" Norton Hydraulic Surface Grinder; M.D.; 10x36 magnetic chuck; new about 1941
1—#100 Mi-cro-matic Honing Machine; new 1943
1—6"x48" Pratt & Whitney Thread Miller
2—Brown & Sharpe Face Grinders (for face grinding of saws, etc.)
1—#16 Blanchard Vertical Spindle Rotary Surface Grinder; 30" magnetic chuck; 25 HP motor; 220-3-60 on spindle

REYNOLDS MACHINERY CO.
210 Eddy St. Providence 3, R. I.

AT AUCTION
Machine Tools & Equipment of Progressive Machinery Co.
104 South 56th Street
Philadelphia, Pa.

Tuesday, September 11, 1945
at 10 A. M., on the Premises

Rockford No. 2 Motor Driven Horizontal Plain Milling Machine with Rotary Table, Sliding and Vertical Attachments, etc. Brown & Sharpe No. 13 Motor Driven Universal and Tool Grinder with Internal, External Cutter Grinder and Surface Attachments, Warner & Swasey No. 1A and 3A Universal Turret Lathes with 4-way Turret Tool Post and Warner & Swasey Box Tools, Motorized; 3 Sidney Back Geared Quick Change Engine Lathes, 17"x8' with Turner Uni-Drive Gear Reduction Units and Motors; Power Back Geared Quick Change Engine Lathe, 18"x9' with Turner Uni-Drive Gear Reduction Unit and Motor; South Bend Bench Type Lathe, 10"x42"; Potter & Johnson 24" Shaper, All Way Feed with Western Gear Reduction Unit and Motor; Marvel No. 8A Motor Driven High Speed Automatic Feed Hack Saw; Racine 6"x6" Power Hack Saw; Armstrong-Blum 6"x12" Hack Saw, Becker-Brainerd No. 1½ Universal Horizontal Plain Milling Machine, Pease 24"x24" Tool Room Planer, Chicago 10' All Steel Hand Bending Brake, Yoder 24" Gap. Rotary Shears, Champion, Excelsior, Delta and Walker Turner Motor Driven and Motorized Vertical Drill Presses, 14" to 21", Floor and Bench Types; Portable AC Electric Flexible Shaft Grinder, Carboloy, Van Dorn and Walker Turner Electric Double End Grinders, Famco 3R Hand Bench Arbor Press, Small Tools and Miscellaneous Equipment.

WRITE FOR CATALOGUE

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AUTOMATICS
2—4 sp. Model M Cleveland, M.D.
1—#2 B. & S. Automatic
1—#00 B. & S. Automatic
1—#0 B. & S. Automatic

GRINDERS
1—#75 Heald, clutch in head
1—#72 Heald, hyd. internal, M.D.
1—#13 B. & S. Universal, M.D.
1—Bath Universal, counter shaft drive
1—1¼" Oliver Drill Grinder, M.D.

LATHES
2—1"x18" Pratt and Whitney Automatic
1—8" Sunstrand Stub Lathe, M.D.
2—8" Sunstrand Full Automatic

DRILLS
4—6 spindle Allen 8" High Speed #2—Morse Taper
4—3 spindle Allen 8" High Speed #2—Morse Taper

MILLS
1—#2 Kearney & Trecker Double Overarm, M.D.
1—#2 Rockford Universal Cone Drive

SHAPERS
21" Smith & Mills, M.D. (Late Type)
24" Gould & Eberhart (Schulte, M.D.)

MISCELLANEOUS
Jones & Lamson Comparator
#7 Long & Allstatter Sprue Cutter
24"x24"x6' Ohio Planer arranged for M.D.

MILLS MACHINERY SALES
3126 GRAND RIVER DETROIT, MICH.

SEND FOR OUR SPECIAL PRICES OF PRECISION TAPPER GROUND TAPS

High speed tapper taps, bent and straight shank. Sizes ranging 3/56 to 10/32 in 90° bent shank. Sizes ranging ¼-28 to ½-20 NF in 90° & 180° bent shank. Sizes ranging ¼-28 to ¾-16 in Acme and straight shank 15" overall. ALL GOOD STANDARD BRANDS FOR IMMEDIATE DELIVERY.

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SEND US YOUR INQUIRIES

1,500 TON KNUCKLE JOINT PUNCH PRESS ONLY TWO YEARS OLD

"Clearing," 1,500 ton cap., straight side machine, with air operating shovel, three station dial on slide for holding punching dies. 48" between uprights. Arranged for motor drive with all electrical equipment. Stroke of slide 6"; Adjustment of slide ½". Area of slide front to back x right to left 48 x 48". Stroke down adjustment 36". Height overall 28'-1½". Area of bolster plate 48" width x 58" length x 7¾" thick. Machine is complete with bolster plate. Only two years old. Used (actually) ten months. No cracks or welds of any kind. Complete with Hydraulic Lifting Device. Cost new: $63,808.00. Our Price: A fraction of the cost to the original purchaser! Truly an opportunity of a life-time!

PAUL'S MACHINERY SUPPLY CO.
6111 Vermont Avenue Detroit 8, Michigan
Phone: TYler 76300

FOR SALE—BROACHING MACHINE

One American standard horizontal broaching machine model H-15-60 serial #3598. Includes a 20 H.P. 1200 r.p.m. 220 volt G.E. motor. Was purchased new in March, 1942. Write

CHICAGO FLEXIBLE SHAFT COMPANY
5600 Roosevelt Road Chicago 50, Ill.
Office number 4

FOR SALE

#304 Oster Pipe machine, complete with new dies, short nipple jaws and auxiliary pipe jaws. Pipe range 1-4; belt range ¾"-1½". Belt drive three step cone.

DENMARK MACHINE CO.
BOX 14 DENMARK, S. C.

OPEN SIDE PLANER

60" x 60" x 14' D & H Reversing Motor Drive

West Penn Machinery Co.
1210 House Building Pittsburgh, Penna.

FOR SALE

Gorton No. 687-1 Graduating Machine, automatic, motor driven, nearly new.

SURPLUS & SALVAGE CO. INC.
Jamestown New York

WANTED

WANTED

Toledo Counting & Weighing Scale, 750 pound weighing capacity
100:1 and 10:1 } Counting Ratio
99:1 and 9:1 }
1800 Model series or similar

DAYTON ROGERS MFG. CO.
2835-12th Ave. S. MPLS. 7, MINN.

WANTED

WATERBURY FARREL FOUNDRY EYELET MACHINE. 6-8 or 10 PLUNGER.

Wire Collect to

VIRJUNE MACHINE COMPANY
23 Jefferson Street Waterbury 40, Conn.

WANTED

Power Press 150 Tons, 10" Stroke, straight side, single action. Preferably single crank, double geared.

UNIQUE ART MFG. CO. INC.
200 WAVERLY AVENUE NEWARK 8, N. J.
Bigelow 3-5630

SEARCHLIGHT SECTION

. . . . *(Classified Advertising)* . . . .

Employment • Business Equipment

(Used or Resale)

"OPPORTUNITIES"

UNDISPLAYED RATE

10 cents a word. Minimum charge $2.00.
(Not available for equipment advertising)

POSITIONS WANTED (full or part time individual salaried employment only), ½ the above rates payable in advance.

PROPOSALS, 50 cents a line an insertion.

BOX NUMBERS—Care of New York, Chicago or San Francisco offices count as 10 words.

DISCOUNT OF 10% if full payment is made in advance for 4 consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE—PER INCH

INDIVIDUAL SPACES with border rules for prominent display of advertisements.

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH measures ⅞" vertically on one column, 3 columns —30 inches—to a page.

NEW ADVERTISEMENTS received by Aug. 16th will appear in the Aug. 30th issue, subject to limitation of space available. A.M.

PRICED TO SELL QUICKLY

MILLING MACHINES

PLAIN

2—No. 3-B MILW., Dble. over., Motor in base, M.D.
No. 1-B MILWAUKEE, Dble. over., cpld. A.C. M.D.
No. 2-B MILWAUKEE, Dble. overarm, M.D.
No. 4 LE BLOND, Heavy Duty, 16¼x68" table, M.D.
No. 3-H LEBLOND Heavy Duty, 16x53" table
No. 2 HENDEY NORTON, 10½x30¼" table, M.D.
No. 15 GARVIN, B.G., 12¾x50" Power feed.

UNIVERSAL

No. 2-B MILWAUKEE, Dble. over., cpld. A.C. M.D.

VERTICAL

PRACT. NEW No. 08 CINC. 6x20" table, M.D.
No. 2 BROWN & SHARPE, B.G., 10¼x38½" table.
No. 2½-B KEARNEY & TRECKER, 14x70" table
No. 1½ KNIGHT, 7½x24" table.

PRODUCTION

6—PRACT. NEW 18" CINCINNATI AUTOMATICS
No. 45 PRODUCTOMATIC; 10" P.&W. SEMI-AUTO.

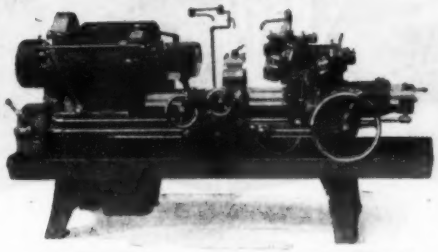
THREAD

6x48" PRATT & WHITNEY, Grd. Hd., 15" swing
No. 3 LEES BRADNER, Belt drive.

SHAPERS & SLOTTERS

3—No. 7A DOUGLAS VERTICAL SLOTTERS, 7" Stroke, M.D.
9" BETTS SLOTTER, 21½" Rotary Table
14" NEWTON SLOTTER, 30" table, A.C. Motor drive, 24" throat.
MORTON DRAWCUT SHAPER, 18' travel, 72" str. Factory Rebuilt

TURRET LATHES



3—No. 2-A WARNER & SWASEY UNIV. HOLLOW HEX., GRD. HD., 2⅝" hole, 18" swing, M.D., CHUCKING EQUIP.

26" LIBBY UNIVERSAL, T.A. Bar feed, 7½" hole.
No. 1 WARNER & SWASEY, Motor Drive, ⅝" cap.
28" NILES-BEMENT-POND, 4¼" hole, Pwr. fd., M.D.
No. 16 GISHOLT SIMPLIMATICS, 21" and 23" Swing, S.P.D.
No. 7 FOSTER UNIV., M.D., Back Grd., P.F.
2—No. 5 FOSTERS, Fric. Hd., Back Geared, P.F.

FLOOR LATHES

2—21"x10' LEBLOND Hvy. Duty 16 speeds Grd. Head, M.D.; 1 with Turret Attach.
51"x22' FITCHBURG, Internal Face Plate Drive; D.B.G.; M.D.; 8' bed extension
30"x16' FIFIELD, LCG, B. Grd., M.D., 130" bet.
17" & 6' LEBLOND Heavy Duty, T.A., M.D.
17"x6' CINC., Back Grd., 1-5/16" spindle, M.D.
16"x6' PRATT & WHITNEY, Q.C.G., geared head, S.P.D., T.A.
16-24-x8' MONARCH, RENOV. GAP TYPE, Q.C.G.
16'x8' AMERICAN B.G., Q.C.G., 17" swing

DRILLS

FLOOR

No. 263 BARNES All-Geared, M.D.
No. 242 BARNES All-Geared, M.D.
No. 216—34" BAKER, No. 5 M.T., M.D.
34" BARNES, Back geared, No. 4 M.T., Power Feed.
32" PRENTICE, No. 5 M.T., Power feed, M.D.
25" SNYDER, No. 4 M.T., Power feed, Back Grd.
3—24" BARNES CAMEL BACK, All geared, M.D.

MULTIPLE

8-SPINDLE MULTIPLE, No. 4 M.T., M.D., 60" bet.

RADIAL

6' AMERICAN UNIVERSAL, Box table, Motor drive
3' AMERICAN, MAXI-SPEED, motor on arm

TWO OR MORE SPINDLE

6-SPIN. LELAND GIFFORD, No. 2 M.T.
4-SPIN. MOLINE "HOLE-HOG," Adj. rail, No. 2 M.T.
4, 3 & 2 SPINDLE AVEYS, No. 2 M.T., M.D.
2-SPINDLE FOOTE BURT DRILLING & BORING
2-SPINDLE LELAND GIFFORD, B.B., Bench type

GRINDERS

SURFACE

15"x15"x96" NORTON; A.C., M.D.; Coolant Pump and Pan; 2 Mag. Chucks
No. 10 ILLINOIS PLAIN, 10x20" Table
12" PARSONS-ARTER ROTARY SURF., with Coolant Pump.
8x30" WALKER AUTO. SURFACE
8" HEALD ROTARY SURFACE, Power feed

INTERNAL

No. 72 HEALD SIZEMATIC, Hydr. Feed, M.D. Ball Bearing Spindle, Oil pump and pan, 15" swing.
No. 70 HEALD 1¼" hole; 15" swing
No. 52 GREENFIELD HYDROILS (2), Hydr. Feed, Ball Bearing Spindle, Pump and Pan.

INTERSTATE Machinery Co., Inc.

1439 W. PERSHING RD., CHICAGO 9, ILL.

INGERSOLL

48" x 48" x 16'
Adj. Rail—Planer Type
MILLER

2 Swivel Rail Heads 2 Swivel Side Heads
Power rapid traverse
Constant Speed Motor Drive

MOREY

MACHINERY CO., INC.
410 Broome St., New York 13, N. Y.

FORGING EQUIPMENT

7" Ajax Upsetting Forging Machine
3000# Chambersburg Steam Drop Hammer

IRON & STEEL PRODUCTS, INC.
13498 S. Brainard Ave. Chicago 33, Illinois
"ANYTHING containing IRON or STEEL"

FOR SALE
600 TON HYDRAULIC PRESS

Watson Stillman rebuilt 48" single daylight opening, downward double acting ram 16" dia. by 21" stroke, platen 24"x24" with clear space left to right 30¼" between 5½" dia. strain rods. We will purchase your Surplus Equipment.

UNIVERSAL HYDRAULIC MACHINERY CO.
285 Hudson Street New York, N. Y.

Just Purchased!

2—300 K.W. BURKE
3 WIRE, 250/125 VOLT
DIRECT CURRENT
SYNCHRONOUS MOTOR
GENERATOR SETS

SPECIFICATIONS:

Generator: 300 KW—Type CB67, 900 RPM 1200 amperes, compound interpole, serial Nos. 136014 and 136129.

Motor: Synchronous 450 H.P.—Type AC88, 3 phase, 60 cycle, 4150 volts, .85 P.F., serial Nos. 136010 and 136011

Equipment: D.C. Panel Board and Reduced Voltage A.C. Starting Panel

Late Modern Equipment—Like New—Could be inspected while in operation.
Location: Cleveland, Ohio

L. J. LAND AND COMPANY
Established 1910
146 Grand St. New York 13, N. Y.
Phone: CAnal 6-6976

McDONALD

USED MACHINERY

Rockford 24" Shaper, S.P.D. gear box.
Cleveland O.S. Planer 36"x8', 2 hds.
American 4' Radial Drill, encl. hd.
Cincinnati D.H. Planer 36"x36"x10', 2 hds.
Barnes geared Camelback Drill Press, 4 sp.
Bullard Vert. Turret Lathes, 24" & 36" S. Head
N.-B.-P. 84" Vert. Boring Mill, m.d. 2 hds.
Cleveland Horiz. Boring Mill, m.d. 2½" bar.
American 24" x 12' grd. hd. Lathe, m.d. q.c.g.
Amer. 4-ton vert. Hydr. Broach.
Blanchard Vert. Surf. Grinder, 26 rd. mag. chuck.
Diamond Horiz. Surf. Grinder, 12"x60" Table, m.d.
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd. S.P.D. Pl. Miller.
Milwaukee No. 3-B Vert. Miller grd. hd., m.d.
Cincinnati 48" Auto. Pl. Prod. Miller, S.P.D.
W.&S. No. 2-A grd. hd. Univ. Turret Lathe, S.P.D.
Foster No. 2F Fastermatic grd. hd. Turret Lathe, M.D.

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1531-35 N. B'way. St. Louis 6, Mo.

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Tioga, Livingston and Almond Streets
Philadelphia, Pa.

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MACHINERY
and EQUIPMENT

LARGE STOCK ON HAND

Hasco MACHINERY COMPANY
661-671 PRELINGHUYSEN AVE.
NEWARK 3, N. J. BIGELOW 3-3486-38

USED MACHINERY OF EVERY DESCRIPTION

Bought · Sold · Exchanged

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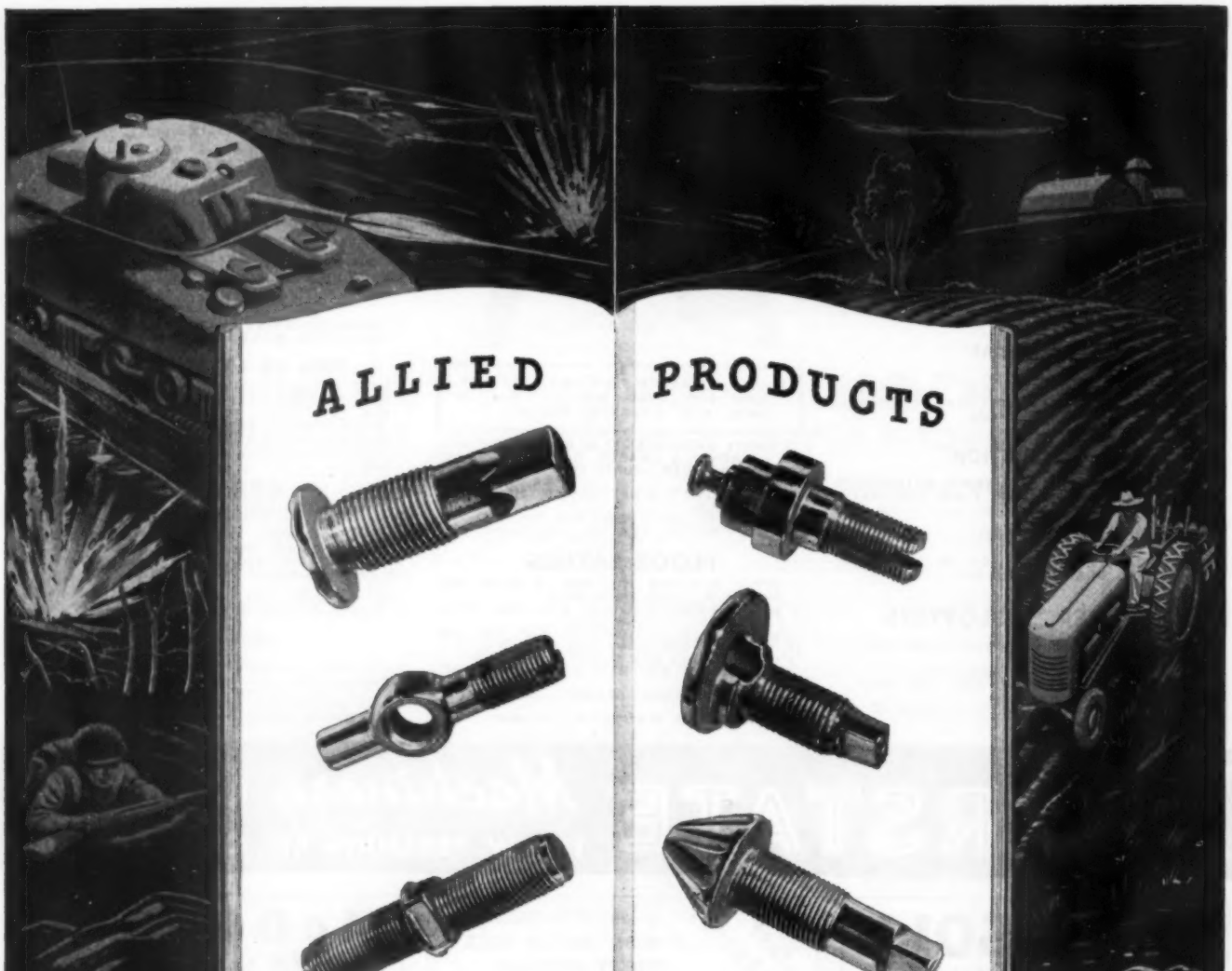

Catalog for War *and* Peace

Here are a few of the cold forgings Allied now makes by the million for thousands of tanks, tractors, trucks and other articles of war. And Allied will make these same cold forgings *in quantity*, or cold forgings very much like them, for the trucks, tractors, cars and other machines that will carry on the good life of peace.

Produced by the thousands or by the millions, each Allied forging of each type is exactly alike, fitting even the finest tolerances. Forged in one piece, from a coil of steel wire, each embodies the strength, flexibility of design and precise dimensions that make dependable quality synonymous with the Allied name. Some of the many products of Allied may solve your peacetime production problems. Anticipate those problems by consulting Allied today.

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"IT'S AN ALLIED PRODUCT" . . . Allied Products Corporation in its Richard Brothers and Victor-Peninsular plants in Detroit and Hillsdale, Michigan, makes cold forged parts, cap screws, sheet metal dies (from the largest to the smallest), R-B interchangeable punches and dies, steam-heated plastic molds, jigs and fixtures and special production tools.

ALLIED PRODUCTS
CORPORATION
Department 23, 4612 Lawton Avenue, Detroit 8, Michigan

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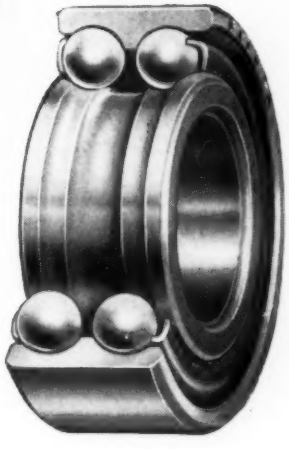
...URNING OUT HEART BEATS FOR BULLDOZERS



Fafnir inner rings for this #5206W bearing are machined to exacting tolerances at the large Fafnir plants in New Britain, Connecticut

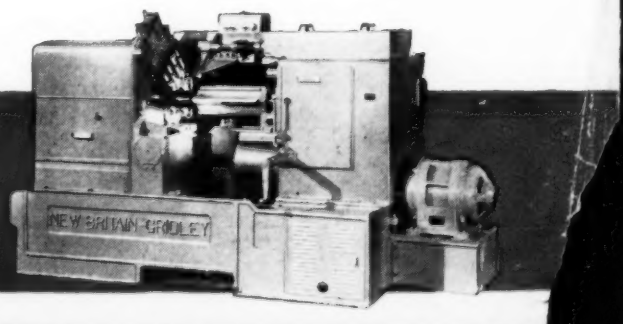
Few weapons of this war have won greater admiration than the versatile and powerful bulldozers. These modern giants are clearing jungles, building airstrips and destroying Jap pillboxes . . . making ready for new advances against the enemy. Behind this big push is a story of Fafnir Ball Bearing performance . . . guaranteeing smooth and dependable action of the gear pump mechanism which hydraulically operates the dozers. Failure of the gear pumps to respond would "kill this workhorse".

The model 61 pictured above is but one of the many New Britains turning out the inner rings of these Fafnirs for gear pumps since early 1940 . . . twenty-four hours a day, seven days a week with downtime held to a minimum. One cycle of the New Britain turns the outside diameter and the bore, forms both ball races, forms the recess between races and finishes both faces . . . speedily and accurately.

You too can profit from this same unprecedented performance in the competitive era just ahead . . . a period when price-per-piece will be an important factor in successful selling. It is to your advantage to discuss your production problems and requirements with the New Britain Sales-Engineer in your district. He has the automatic solution.

NEW BRITAIN AUTOMATICS

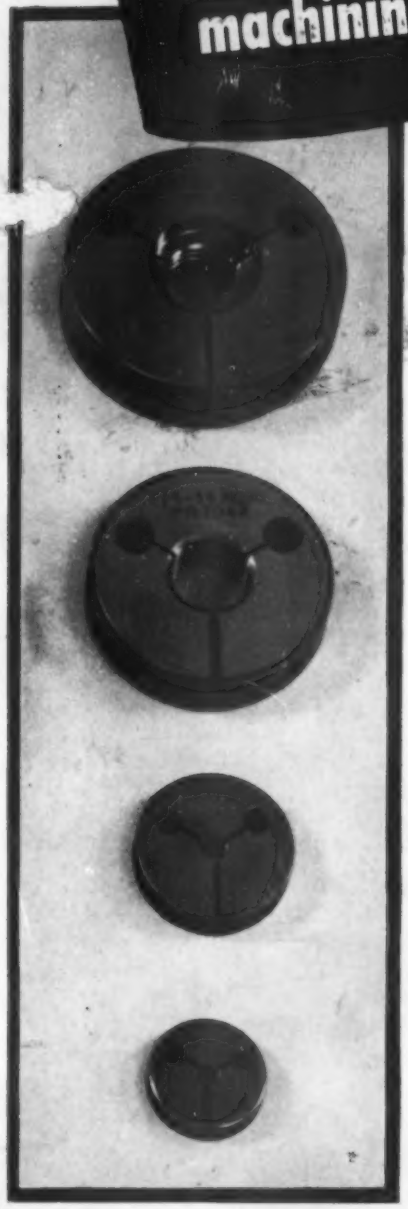
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY MACHINE DIVISION



M-01012

By making gages of GRAPH-MO STEEL machining time was cut 30%

Unretouched photo of thread ring gage made of Graph-Mo Steel in as machined condition. Note smooth thread, free of tears.



By using Graph-Mo Steel Perfex Gage and Tool Co., Detroit, Michigan have increased production of thread ring gages without compromising the high standard of quality they have constantly maintained for their products.

The free machining qualities of Graph-Mo Steel enabled Perfex to produce a good, clean thread, free from tears which reduced lapping and saved 30% in machining time. This enabled Perfex to machine three gages in the time formerly required for one! As a consequence they use Graph-Mo Steel for all ring gages up to 72 pitch.

Graph-Mo is an oil hardening non-deforming tool steel and is one of the five performance-proven Timken Graphitic Steels. These steels contain free graphite which gives them remarkable free machining qualities, high resistance to wear and good frictional properties with less tendency for pick up and scoring than with competing tool steel grades.

Take advantage of the superior qualities of Timken Graphitic Steels. Use them to speed production and to give tools and dies a long life. For complete details about these steels write to The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio.

TIMKEN

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GRAPHITIC STEELS